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THE BEHAVIOR OF TRANSPLANTED BONE

A CLINICAL CONSIDERATION[1]

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IT is the purpose of this paper to discuss briefly the theories and facts regarding the behavior of various types of bone grafts, to suggest that certain ideas which have seemed contradictory are reconcilable. Clinical evidence of the latter is presented together with a short consideration of the technique of bone grafting.

Successful results following the transplantation of living tissue have been well established. Better and simpler methods for handling such tissues are even now being perfected. The future promises much. This is especially true in the field of reconstructive bone surgery. Ollier first gave definite evidence upon which much of our present day technique is based. The rôle which the periosteum plays in bone formation was carefully worked out by him and today stands, disputed but not disproved. His belief that homogeneous periosteal transplants do regenerate bone is upheld by Axhausen, Lexer, Mayer and Wehner, Mock and others. On the other side of the question stand Macewen, Dorrance, Ely, and others. It is their contention that pure periosteal transplants do not regenerate bone, and that when seemingly successful results have been obtained it has been because bits of cortex and cambium layer have been removed with the periosteum. Be that as it may, it is of practical importance to know that we can expect bone regeneration following subperiosteal resection and transplantation of periosteum, removed under aseptic conditions with careful technique.

Since Ollier's report, much work has been done on bone growth. It is not the purpose of this paper to review this work in its entirety. It will suffice to mention, briefly, work pertinent to the question of bone transplantation, including in this category the various types of bone grafts.

The circulation is a very important factor. Johnson, by his thorough investigation, has shown what part is played by each of the three nutrient systems of the long bones. His conclusions are that the nutrient vessels which supply the medulla and inner half of the cortex enhance active repair in the absence of the two other systems. The metaphyseal system supplying the same areas affords slower, but complete repair in the absence of the two other systems. This is noticeably marked at the mid-shaft. The periosteal system nourishing the periosteum and outer half of the cortex does not establish a collateral supply in the medulla under 4 weeks and in the absence of the two other systems produces poor healing of cortical defects. Regarding the shaft as a whole, bone regeneration depends upon a blood supply from the systems in the order mentioned.

Axhausen reports several cases of ischæmic bone necrosis and throws considerable doubt

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on the teaching that bone is not susceptible to infarction. Morton and Stabins have shown that a partial block in the veins of an extremity in which there is a fracture seems to cause delayed union. They found this also held true for resection. Pollock, Blaisdell, and McKenney state that a bone graft will live only if it is quickly surrounded by well vascularized connective tissue. Bancroft also believes that a successful graft depends upon the ease with which a blood supply is established. We can scarcely overlook the fact that success or failure in plastic bone surgery depends upon a good blood supply to both bone and soft tissue surrounding bone. It would also seem that rupture of the nutrient artery did not necessarily mean failure of union.

Next, it is well to consider the various bone elements and their functions in bone regeneration. Haas has shown that the increase in bone length is entirely dependent on the multiplication of cartilage cells of the epiphyseal cartilage plate and is not aided by interstitial proliferation, and also that the increase in thickness is due to deposition of new bone from periosteum.

The rôle of the periosteum has been discussed, but in addition to the question of its power to regenerate bone, *per se*, this covering has other functions. Mock believes that the periosteum, together with the endosteum, contains the chief factors for osteogenesis. Ely has shown that osseous union is good, provided the periosteum is intact; that with complete division of the periosteum, non-union results and that if the periosteum is slit longitudinally, in several places, there may or may not be union. From this he concludes that the periosteum probably protects the enclosed hæmorrhage and granulation tissue, that it has no bone forming function, and that bone is not built out of it. Mock has demonstrated that the more completely surrounded the site of fracture by periosteum, the quicker and stronger the union.

The cambium layer is of striking importance as bone regeneration usually takes place in its presence. This has been well pointed out by Mayer and Wehner, Brooks, Phemister, Thalhimer, and Haldeman. This is found to be true whether it is attached to periosteal or cortical transplants.

Can transplanted cortex be expected to regenerate bone, and if so must it be living tissue? In either case it furnishes a good internal splint. Lexer found that living bone was preferable to dead bone. He states that he has never failed to gain a successful transplant if the transplanted living bone was attached to its periosteum. Haas, Ely, Sutton, and Pollock have shown that transplanted boiled bone does not live or stimulate new bone formation. Mayer and Wehner have been able to secure new bone production from periosteal free transplants but they believe that it was owing to the fact that the cambium could not be stripped from the cortex nor could the osteoblasts be removed from the marrow or the haversian canals. Bancroft, Ely, and Janeway are of the opinion that all grafts die and act only as a framework upon which new bone is formed. It is impossible, at present, to conclude definitely whether or not living cortex produces new bone. We do have evidence that the endosteal cells lining the haversian canals have some function in bone formation. This was pointed out by Brooks and has been mentioned.

The reports of Johnson, Brooks, Mayer and Wehner, Mock, Ely, and Campbell lead to the conclusion that endosteum forms callus. We have been unable to find any experimental evidence pointing to regeneration of bone from transplanted endosteum alone.

Marrow does play some part in contributing endosteal cells for bone production. McGaw and Harbin have just finished a series of transplants of bone marrow in dogs. They found that extraperiosteal defects, produced surgically in the fibula, are completely bridged by bone following the transplantation of curettings from the marrow cavity of the tibia. Most workers advise using an entire bone segment for inlay grafts, including marrow. Lexer finds it advantageous to remove it in the transplantation of complete segments of tubular bone.

The question of whether or not a bone graft lives is still much debated. There are good arguments on each side. Laelen, Frankenstein, Pakopilo, Lobenhoffer, Lexer, and Axhausen

hold that the bony part of the transplant becomes absorbed, the periosteum survives and lays down new bone. Baschkirzew and Petrow, on the basis of animal experimentation and clinical cases, conclude that it is not necessary to include periosteum in the transplant in order to obtain new bone. Mayer and Wehner state that the already mature bone cells do not show proliferation. Axhausen, Brooks, Haas, Phemister, and Thalhimer maintain that a free bone transplant is a source of regeneration of bone and not merely a skeleton upon which bone is formed.

Bancroft holds that transplants, *per se*, do not live but act as a framework and help to establish "a favorable chemical state." Ely and Janeway are also of this opinion.

And so we may look to either side of many questions. From a surgical standpoint it has been amply demonstrated that bone defects can be repaired by transplanting or grafting periosteum, osteum and periosteum, osteum and endosteum, complete sections to include all layers, complete bone segments and even entire joints. With this we can proceed to a consideration of types of grafts and indications for their use believing that the cases to be reported indicate that homotransplants of any of the bone elements live as such. Further, it is our feeling that much evidence regarding the behavior of bone transplants which has seemed contradictory is consistent. This statement is based upon our impression that there are several ways in which bone may behave and that the reparative process may not always be the same.

It is our opinion that metal plates should be discarded in favor of living bone grafts in all fractures in which solution of continuity cannot be maintained without the aid of an internal splint. We will consider the full thickness inlay, the cortical onlay, the osteoperiosteal, the medullary, the sliding and the massive transplant grafts (Fig. 1).

The first two are probably of equal value. Both contain all bone elements and provide adequate internal splinting. The onlay graft has the advantage of incorporating only living tissues in the repair as the graft is secured with autogenous bone pegs. The inlay graft

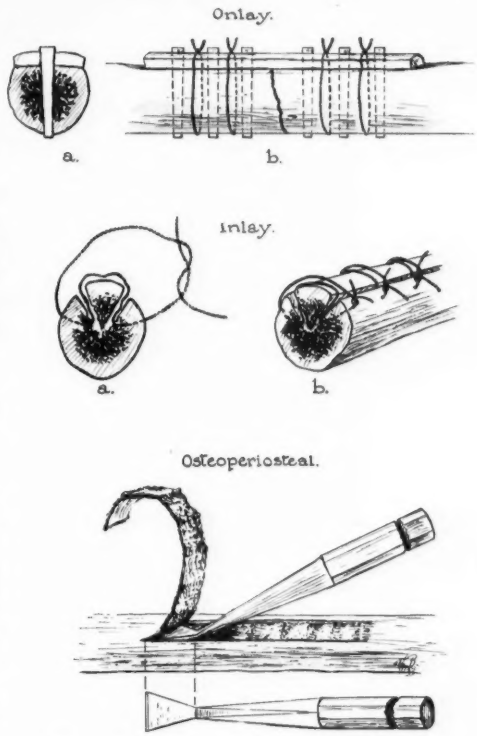

Fig. 1. Technique of three types of bone grafts.

affords a stronger splint but requires careful fitting and should be secured into a carefully prepared bed with braided silk ligatures.

The osteoperiosteal graft may be used in fractures not requiring an internal splint. We report its use as a method to increase the thickness of transplanted bone.

The medullary graft is to be condemned as it is in direct opposition to normal bone physiology and its use more often results in failure than in success.

The sliding graft is good and can always be used in fractures in which sufficient bone length is present to permit a graft of adequate length to be cut. It is valuable because only one operative field is necessary. It avoids the danger of cross contamination.

Massive transplants are of value in replacing bone which has been resected. The procedure is usually carried out in two stages in

Fig. 2. Fig. 3. Fig. 4. Fig. 5.

Fig. 2. Case 1. Pre-operative film showing eburnation at the ends of the fragments.

Fig. 3. Case 1. Film taken 7 months following transplantation of the intramedullary graft and 2 weeks following its fracture. Partial absorption of the graft and marked atrophy of the fragments is well shown.

Fig. 4. Case 1. Three months following transplantation of the inlay graft. The graft appears viable. There is good callus formation.

Fig. 5. Case 1. Five months following transplantation of the inlay graft. The defect has been completely bridged by bone. There is no evidence of absorption of the graft.

an effort to maintain, at all times, an adequate blood supply for the transplanted fragment.

The material in the following protocols covers each type of graft. It is also of interest because it shows something of the behavior of transplanted bone, even in the presence of infection.

PROTOCOLS

CASE 1. A white male, 57 years old, was admitted to the Lakeside Hospital July 5, 1932, with an ununited fracture at the junction of the upper and middle thirds of the right humerus. The fracture had been sustained in December, 1931. Closed reduction was carried out in another hospital. Union did not take place, and an open reduction was done at the same hospital in March, 1932. At that time about 3.5 centimeters of bone was resected. After 4 months there was no union.

The past and family history were unimportant.

The patient was well developed and nourished. The general physical examination was not important. The right arm showed moderate atrophy but sensation was intact. There was 3 centimeters' shortening. The ends of the two fragments were palpable and a false joint was present. The examination of the blood and urine was normal. The Wassermann reaction was negative. The blood calcium was 11.0 milligrams per cent. X-ray films showed an ununited fracture with no callus formation and separation of 1 centimeter (Fig. 2).

On July 6, 1932, an open reduction was carried out. The incision, made over the inner border of the deltoid muscle, was carried down to the bone. The ends of the exposed fragments were covered with a cartilaginous cap and were densely eburnated. Surrounding the false joint was a membranous sac similar to synovium, filled with fluid. The ends of the fragments were freshened and the medullary cavity entered. A full thickness graft 9 by 1.5 centimeters was removed from the tibia and placed within the medullary canal. No sutures were placed. The muscles and skin were then closed in two layers. The arm was immobilized in a plaster shoulder spica. X-ray films showed the fragments to be in good condition. The wounds healed *per primam* and the patient was discharged on the thirteenth postoperative day.

The spica was removed after 4 months and physical therapy was started. X-ray films showed only slight callus formation and some absorption of the

Fig. 6.

Fig. 7.

Fig. 8.

Fig. 6. Case 2. Film taken before operation. This shows sclerosis of the ends of the fragments and marked angulation. Fibrous union is present.

Fig. 7. Case 2. Taken 5 days following the application of the onlay graft. This shows quite well the position of the autogenous bone pegs.

Fig. 8. Case 2. Film of tibia and fibula 4 years following graft.

graft. Two weeks later, under minimal strain, the graft fractured (Fig. 3).

On the second admission, in February, 1933, roentgenograms showed complete absorption of the graft, marked atrophy of the fragments, and complete separation. The laboratory findings were not remarkable

On February 24, 1933, an open reduction was carried out. The incision was carried down through the anterior portion of the deltoid muscle and the bone exposed. A false joint was encountered. The fibrous tissue covering the ends of the fragments was cut away. The periosteum was stripped from the anterior surface of both fragments. The medullary canal was entered with a drill. None of the previous graft remained. No sequestrum was found. A V-shaped, full thickness graft, 15 by 2 centimeters, was removed from the tibia and securely fastened into a previously prepared bed with overlapping braided silk ligatures. The periosteum, muscles, and fascia were closed in two layers. The skin was closed with silk. The arm was immobilized in a plaster shoulder spica. The wounds healed and the patient was discharged after 24 days.

On May 11, 1933, X-ray films suggested that the graft was viable (Fig. 4). Callus formation was present.

On July 18, 1933, X-ray examination showed complete union (Fig. 5). Clinically union was solid. Function was good.

CASE 2. A girl, 11 years old, white, entered the Lakeside Hospital in November, 1927, with a marked deformity of the left leg. Six years previously, in Canada, a metal plate had been applied to the left tibia following fracture. The bone became infected. Several operative procedures followed in an effort to institute drainage and also to straighten the resulting deformity. The osteomyelitis was arrested but the deformity was never overcome. The family history was not important. The physical examination was not remarkable except for the left lower extremity. There was marked anterior and lateral angulation of the tibia and fibula, with only fibrous union of the tibia (Fig. 6). The anterior angulation measured 120 degrees. There was 2 centimeters' atrophy of the thigh and 5 centimeters' shortening of the leg. There were no sensory or motor changes. Numerous scars were present over the leg. The laboratory findings were entirely normal.

On November 15, 1927, a wedge osteotomy and lengthening of the tendo achillis was carried out. The ends of the fragments were secured with braided silk ligatures. The periosteum was closed over the site of apposition and the soft tissues approximated in the usual manner. The leg was immobilized in plaster. X-rays showed satisfactory position, no angulation, but marked sclerosis of the bone. The wound healed and the patient was discharged on the thirty-ninth postoperative day.

Union failed and the patient again entered the Lakeside Hospital in July, 1928. On September 15, 1928, an onlay graft, 13 by 2 centimeters, was removed from the right tibia and secured over the site of fracture with six autogenous bone pegs. A piece of

medullary bone was also placed in the medullary canal. (According to the method described by Campbell and Henderson.) The leg was immobilized in plaster. At operation the left tibia was found to be atrophic. There was no callus. Fibrous union existed. X-ray films showed good position following operation (Fig. 7). The wounds healed and the child was discharged after 9 days.

On May 21, 1929, this child fell and fractured the right tibia. She was again brought to the Lakeside Hospital. This fracture was reduced and the child was again discharged. At this time there was both clinical and X-ray evidence of good union in the left tibia.

On June 28, 1932, X-ray examination showed both fractures completely united (Fig. 8). Function in both legs was normal. There was shortening of 2 centimeters in the left leg.

CASE 3. A 19 year old white female entered the Lakeside Hospital on April 22, 1931, with a flail right arm. In 1924, she had injured the right arm and the bone had become infected. The upper portion of the humerus was resected. (This treatment had been carried out in Vienna and we did not obtain information concerning the details). The past history and the family history were unimportant.

On examination the findings of interest were limited to the right upper extremity. There was considerable atrophy of the part. Several linear surgical scars were present. The shoulder joint was flail. The upper end of the humerus could be palpated 4.5 centimeters below the shoulder. The urine and blood studies were normal. X-ray examination showed the humerus to end in a tapered point (Fig. 9). The entire bone was reduced in circumference and flattened in the anteroposterior diameter. The bone was sclerotic.

On April 24, 1931, the upper 11 centimeters of the right fibula was transplanted. Scar tissue was removed from the upper 11 centimeters of the humerus and the proximal 2.5 centimeters of the bone was removed. The posterior portion of the bone was removed for a distance of 3 centimeters exposing the medullary canal. Compact bone was then cut from the distal 8 centimeters of the fibular transplant. The head was placed in the glenoid cavity and secured by suturing the scar tissue around it. The freshened bone surfaces were approximated and secured by braided silk sutures threaded through perforations. Care was taken to approximate the periosteum. Soft tissue closure was carried out after the usual fashion. The arm was immobilized in a spica in 40 degrees' abduction. X-ray films showed the position to be excellent (Fig. 10). The patient was discharged on the twenty-first postoperative day with the wound healed.

Firm union resulted and she obtained a fair degree of function. In March, 1932, while ironing and using this arm, the patient fractured the right humerus, but she did not report to our clinic until April 5, 1932. At this time X-ray examination showed a comminuted fracture through the transplanted fibula about 4 centimeters from its insertion into the humerus (Fig. 11). The arm was immobilized. Nothing further was done as we wished to observe whether callus formation or absorption would follow. She again entered the hospital on May 20, 1932. The X-ray showed absorption and no callus formation. On May 21, 1932, two osteoperiosteal grafts were removed from the left tibia and secured over the site of fracture with No. 0 chromic catgut sutures tied around the bone. Several small bone chips were also placed between the ends of the fragments. The arm was immobilized in a plaster spica, abducted 35 degrees.

At operation, as soon as the periosteum over the transplanted fibula was incised and elevated, there was considerable oozing, suggesting it to be well vascularized. Bleeding took place from the ends of the fragments as well. Following this procedure X-ray examination showed good alinement. On July 5, 1932, there was good callus formation but no union. The patient was discharged on the sixty-third postoperative day. On May 11, 1933, roentgenograms showed good union (Fig. 12). The patient was using the arm and the total range of motion was 50 per cent of normal.

CASE 4. A white male, aged 43 years, entered the Lakeside Hospital on January 6, 1933, with an ununited fracture of the left tibia. In September, 1931, he sustained a compound fracture of both bones in both lower extremities. Closed reduction resulted in union; however, there was overlapping of the fragments in the left leg. The bones were surgically fractured and reset. Non-union resulted.

The past and family history were not important. The general physical examination was not of note. The left leg was 2 centimeters longer than the right with some atrophy of the calf and thigh. False motion was present. The lower fragment was posterior. Laboratory findings were normal. X-ray films revealed that there was an oblique fracture at the junction of the middle and lower thirds of the tibia with considerable callus about the proximal fragment (Fig. 13). Also, there was a comminuted fracture of the fibula.

On January 7, 1933, an operation utilizing a sliding bone graft was carried out. Fibrous union was present. Excess callus and fibrous tissue were removed with an osteotome. The lower fragment was eburnated. Multiple drill holes were made into the medullary cavities of both fragments. A sliding graft, 13 by 2 centimeters, was cut from the upper fragment. A corresponding portion of bone was removed from the lower fragment. The graft was secured with overlapping braided silk sutures passed through perforations. The periosteum was approximated and the soft tissues were closed. The entire leg was immobilized in plaster. X-rays on January 12, 1933, showed some posterior bowing. Another cast was applied. It was necessary to wedge the cast in order to secure good alinement (Fig. 14). The patient was discharged on the fifteenth day after operation with the wound well healed.

Fig. 9. Fig. 10. Fig. 11. Fig. 12.

Fig. 9. Case 3. Pre-operative film showing absence of proximal portion of the humerus, marked sclerosis and decrease in the thickness of the remaining bone.

Fig. 10. Case 3. Film showing transplanted fibula in position.

Fig. 11. Case 3. One year following transplantation of the fibula and 1 month following fracture of the graft. The proximal fragment has the appearance of normal bone. The distal portion of the transplanted fibula appears to have established complete continuity with the humerus.

Fig. 12. Case 3. One year following the application of two osteoperiosteal grafts.

On March 29, 1933, X-ray films showed good position, with definite callus formation. Clinically there was union.

The patient returned to the clinic 3 weeks later. Against our advice, he had removed the cast at home. Examination of the extremity showed the callus to be soft. X-ray showed beginning absorption of the callus across the fracture line. The leg was again immobilized in plaster. The last examination, on September 20, 1933, showed the callus to be firm and non-tender. The X-rays revealed bone formation at the site of the graft, but none where the fragments were simply in apposition (Fig. 15).

Case 5. A 14 year old white female entered the Lakeside Hospital on July 11, 1921, with chronic osteomyelitis of the right tibia of 2 years' duration. Incision and drainage were carried out on several occasions but there was no improvement.

The child had had frequent infections of the ears and throat. One brother had tuberculosis. The patient was well developed and nourished. The general physical examination was unimportant. Several scars were present over the right tibia. There were no discharging sinuses. There was no atrophy or shortening. Joint motion was normal. The blood and urine were normal. X-ray films showed evidence of chronic osteomyelitis.

Over a period of 1 year, multiple incisions for drainage of the infection were carried out. At the end of a year all drainage had ceased and the patient was discharged.

On November 5, 1924, she again entered the hospital with a discharging sinus leading to the middle third of the tibia. X-ray films showed involvement of the entire shaft of the tibia. A subperiosteal resection of the entire shaft of the tibia was carried out. The periosteum was sutured over Dakin's tubes and the leg was immobilized. After 4 months of treatment all evidence of osteomyelitis disappeared but the X-rays showed no bone regeneration. The patient was discharged wearing a plaster splint.

She next entered the Lakeside Hospital on May 14, 1925, for transplantation of the fibula. X-ray films showed no bone regeneration. There had been no drainage for about a year and a half. The lower end of the fibula was secured into a groove cut in the lower tibial stump. The periosteum was then approximated over the junction. The usual closure

Fig. 13.

Fig. 14.

Fig. 15.

Fig. 13. Case 4. Pre-operative film showing non-union of tibia and fibula.
Fig. 14. Case 4. Film 7 days following sliding bone graft.
Fig. 15. Case 4. Film 7 months postoperative and 18 weeks following application of the second plaster splint. Anteriorly, trabeculations of bone can be traced across the fracture line. Posteriorly, away from the graft, there is no evidence of this.

was carried out. The leg was immobilized in plaster. X-rays 2 months later showed firm union.

She returned September 22, 1925, for transplantation of the upper end of the fibula. This was done. The periosteum was closed over the junction. A plaster splint was again applied.

Two months later there was no evidence by X-ray examination of bone regeneration. A reimplantation was done. At operation there was found no evidence of osteogenesis. Both fragments showed marked atrophy. A new bed was prepared in the stump of the tibia and two chromic catgut sutures were used to anchor the fibula into this groove. Periosteum again covered the site of transplantation. The leg was immobilized with plaster. The patient was discharged 2 months later. X-ray examination showed good union of the lower fragments but no evidence of bone regeneration at the site of the recent transplant. Alinement was good. X-ray examination 4 months later showed only slight callus formation. Clinically there was non-union. The patient was able to walk in a brace, however.

She was followed for 5 years. Subsequent X-ray films showed complete union of the graft to the tibial stumps. However, the transplanted fibula was inadequate for weight bearing and it was necessary for her to wear a brace continuously. She was somewhat overweight (Fig. 16).

The next admission to the Lakeside Hospital was on November 11, 1930, at which time two osteoperiosteal grafts,9 by 1 centimeters were removed from the left tibia and placed on the lateral and medial cortical surfaces of the right fibula which had been freshened with an osteotome (Fig. 17). These grafts were secured by multiple No. 0 chromic catgut sutures. The periosteal edges were approximated with the same material. The right leg was immobilized in plaster. The wounds closed by first intention and the patient was discharged on the twenty-eighth postoperative day.

A brace was soon applied and the patient's condition was good until February 19, 1931, when she was readmitted for incision and drainage of a soft tissue abscess over the lower, lateral aspect of the right leg. Repeated X-ray examinations showed no evidence of osteomyelitis. They did reveal increase in thickness of the transplant. The wound healed and the patient was discharged.

Roentgenograms taken September 11,1931, showed that there was definite proliferation around the transplanted fibula.

She began to walk without a brace in August,1932, and has continued to walk without support. X-ray films on March 29, 1932, showed considerable increase in circumference of the transplanted fibula (Fig. 18).

Fig. 16. Fig. 17. Fig. 18.

Fig. 16. Case 5. Film 5 years following transplantation of the fibula. Hypertrophy has failed to take place.

Fig. 17. Case 5. Postoperative film showing the osteoperiosteal grafts in position. This gives a very good conception of "shaving-like" quality of freshly removed graft.

Fig. 18. Case 5. Film one and one-half years following the application of the osteoperiosteal grafts. This roentgenogram shows that there is thickening of the cortex and considerable increase in the circumference of the transplanted fibula.

CASE 6. A white female, 6½ years of age, was admitted to the Lakeside Hospital September 18, 1929 with acute osteomyelitis of the left tibia which developed following trauma to the dorsum of the left foot. Five weeks before she had cellulitis of a finger subsequent to a puncture wound. This infection subsided under treatment.

The acute osteomyelitis had been treated in another hospital. Following incision and drainage, she was transferred to the Lakeside Hospital. The family history and the past history were unimportant. Examination showed an acutely ill, quite pallid child. The heart revealed a mitral stenosis with insufficiency. The left inguinal nodes were enlarged and palpable. Pus exuded from four incisions over the lower tibia. Swelling, redness, and bone tenderness were present. The urine was normal; the white blood count was 12,000; red blood count 3,400,000; hæmoglobin 65 per cent. X-ray films showed definite evidence of osteomyelitis of the left tibia. Subsequent incision and drainage was carried out with no improvement. X-ray examination showed progressive bone destruction. Resection of the tibia was advised and executed.

Both ends of the exposed tibia were almost devoid of attachment. The entire shaft was removed and the periosteum remaining was sutured to form a gutter. Dakin's tubes were inserted. The leg was immobilized in a Cabot splint. A plaster splint was applied on the twenty-third postoperative day and the patient was discharged 15 days later, at which time the wound was largely healed. X-ray films taken at that time showed no evidence of bone regeneration.

Fig. 19, left. Case 6. Seven months following transplantation of the lower end of the fibula into the stump of the tibia.

Fig. 20. Case 6. Film 20 months following transplantation of the upper end of the fibula.

The wound healed completely but there was only slight regeneration of bone. There had been no evidence of osteomyelitis for 18 months prior to April 4, 1931, when the child again entered the Lakeside Hospital for transplantation of the fibula. The lower end of the fibula was transplanted into a groove made in the distal stump of the tibia and the periosteum approximated with No. 0 chromic catgut sutures. The leg was immobilized in plaster. X-ray examination showed good position.

The wound became infected and drained for 4 weeks. Roentgenograms 4 weeks after transplant showed proliferation of the periosteum over the lower fibula and no evidence of osteomyelitis. The child was discharged.

Several weeks later drainage appeared. Because of persistent drainage and X-ray evidence of bone destruction, a sequestrotomy was carried out on July 15, 1931. After removal of the sequestrum about 2 centimeters of the distal fibula remained attached to the lower tibial fragment.

Maggots were then implanted on three occasions, at five day intervals. A plaster splint was applied and the child was discharged. Slight drainage was still present. After 6 weeks of convalescence, all drainage ceased.

On November 21, 1931, X-ray films showed excellent union of the bone and no evidence of osteomyelitis (Fig. 19). On January 4, 1932, a subperiosteal transplantation of the upper end of the fibula was carried out. The fibula was divided just below the epiphyseal line and secured, with a No. 1 chromic catgut tie, into a linear groove cut in the tibial stump. The periosteum was approximated and the wound closed. The leg was encased in a plaster splint.

This wound again became infected and it was necessary to incise and remove a few small sequestra. Maggots were again implanted on three occasions. The leg was immobilized. Drainage gradually subsided. X-ray films on March 22, 1932, showed a definite bridge of bone extending from the upper fibular stump to the transplanted fibula, but no bone regeneration at the site of the transplant. The child was discharged in December, 1932. She was then walking in a caliper splint.

On March 30, 1933, the child was walking without support. There was 4 centimeters' shortening of the left leg. Function was good. X-ray picture taken on September 1, 1933, showed good union and satisfactory hypertrophy of the transplanted fibula (Fig. 20).

These cases have been selected because they illustrate several factors concerning the behavior of bone repair and regeneration. Case 5 represents a method of utilizing an osteoperiosteal graft to increase the volume of bone. No attempt is made to draw unqualified conclusions from so few cases.

It is our feeling that a large percentage of homotransplants live as such. Case 3 furnishes several examples. At the end of a year the transplanted bone was completely revascularized. Bone atrophy took place in the absence of function as normal bone does and bone regeneration was again stimulated by the introduction of transplanted bone. In the last 2 cases it is our opinion that massive transplants do not die in entirety, that in the absence of infection union usually takes place early. This entails osteoclysis and osteolysis at the site of union but no change in the shaft. The much disputed question as to whether or not every cell of transplanted bone dies and is replaced need not be disturbing. It may well be true that a degree of "creeping substitution" takes place. That piece of bone lives if we can consider growth and revascularization any indication of life. We do not know the exact mechanism of this rehabilitation nor

have we found any evidence in the literature which would lead us to an unquestionable answer. When bone is transplanted, according to proper technique, we expect growth in 90 per cent of all cases. In the absence of infection and disturbance in circulation this should approach 99 per cent, provided the transplant is properly carried out and immobilization maintained over a sufficient period of time.

Infection does not mean absolute failure. In our last reported case infection complicated each procedure, yet this child eventually secured good union. We must, however, expect delay and in some cases failure.

In order to emphasize the inadvisability of using the intramedullary graft we again refer to Case 1. In this instance it is also interesting to note that the transplant was completely absorbed in 7 months. This is often the fate of such a graft. Also when the graft "takes" it frequently results in a painful member.

Case 2 is of considerable interest. After osteotomy with good reduction, the sclerotic bone failed to unite. After application of an onlay graft union was solid. We must conclude that the graft had much to do with the production of new bone as no other factor had been altered.

Case 3 also offers an example of the type of fracture in which an osteoperiosteal graft is sufficient to bring about firm union. In support of our original statement, we find it hard to explain solid union within 5 months had the transplanted fibula not been living bone.

The fourth case brings up a question of some practical importance, namely, should a fracture undergoing repair be subjected to major trauma. Clinically there was union after 8 weeks. At this time the bones were refractured. Non-union resulted. Such a result is observed in fractures not sufficiently immobilized. The physiological process must be similar. It would seem that in such a case intervention should be very early. After 2 months it would probably be wiser to wait for a period of 1 year before attempting closed refracture and reduction. The case also demonstrates the efficacy of a sliding bone graft. It also demonstrates the necessity of an adequate period of immobilization.

Case 5 demonstrates the ability of an osteoperiosteal graft to stimulate bone production. It was obvious that even after a period of 5 years, the transplanted fibula was not of sufficient diameter and strength to bear the weight of a girl weighing 150 pounds. The osteoperiosteal grafts were applied directly over the shaft of the transplanted fibula. New bone was formed and became a part of the fibula. Today, the strength of the bone is adequate. The girl is walking without support and her weight is in the neighborhood of 150 pounds.

The last case recalls, once again, the hazard of bone surgery in cases of arrested osteomyelitis. Bacteria hide away in well protected lacunæ. They may live for years. Once these spaces are opened, they grow with renewed vitality. Such a complication is difficult to avoid, but one should not be surprised should it occur. Maggot implantations were used and we have used them in children in infected ununited fractures with resultant union. It is our impression that the maggots or their by-products stimulate osteogenesis. It is also of some interest to note that even before there was union of the fibula to the upper tibial stump, osseous regeneration had taken place from the upper epiphyseal line of the fibular stump and that this bone was firmly united to the transplanted fibula. This took place even in the presence of infection.

We do not advocate radical resection for osteomyelitis. The results of fibular transplantation in the few cases which we have had to do offers hope in those individuals who may be so unfortunate as to have been subjected to such a radical procedure.

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A METHOD FOR DETERMINING THE TIME OF CATGUT DIGESTION *IN VITRO*[1]

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At a recent symposium conducted by the New York Surgical Society (5), the frequency of wound disruption with its high mortality was emphasized by representatives of five of the larger hospitals of this city. All of the various factors which interfere with normal wound healing were discussed. We were particularly impressed with one significant fact brought out by several of the authors who pointed out that often no trace, or very little trace, of the chromic catgut suture material could be found at any of the secondary operative closures. These were usually performed on the day of disruption and occurred from 3 to 15 days after the primary procedure.

In a certain number of cases, pancreatic, biliary, or gastric discharge might have been responsible for the premature digestion. In another group of cases infection may have played an important rôle. This relationship between infection and rapid catgut absorption has frequently been observed clinically and certain experimental observations have been made which seem to demonstrate its importance (2).

The majority of disruptions occur, however, in cases in which infection is not a prominent feature. These can be explained only on the basis that the sutures do not maintain the approximation of the tissues until healing has been adequate to withstand the tension caused by intra-abdominal pressure or general body movements. This fact emphasizes the importance of obtaining a better knowledge of catgut digestion within the body. Howes has studied this problem and has attempted to measure the rate of wound healing in various animal tissues (4). He has recently compared the strength of wounds sutured with catgut and silk in the rat's stomach (3), and has found that the wounds sutured with silk are consistently stronger and healing takes place with greater speed than in those sutured with catgut.

Porta was among the first (1845) to observe the absorption of various suture materials in animals. He noted considerable variation in the absorption time of catgut. Lister suggested sterilizing catgut with carbolic acid and prolonging its absorption time by chromicizing. Many others have studied the absorption of catgut *in vivo* with considerable variation in the results (1). This is readily understood when one considers the factors which operate under these experimental conditions. There are individual variations in the animals which are used. The position of the suture in the tissue, and the tension under which it is placed, are both difficult to control, and no two investigators have adopted exactly the same method. Other important factors which have been shown to influence the absorption of catgut (2) are obviously uncontrollable,—namely the blood supply of the tissue, the degree of exudation and bleeding about the suture when it is inserted, as well as the factor of bacterial contamination which occurs even in apparently clean wounds made with the usual aseptic precautions. With such variable factors in animal experimentation, it seems almost impossible to standardize the absorbability of catgut by those methods, and we know of no other generally accepted method which lends itself readily to standardization.

At present we are guided to a large extent by the statements made by the various catgut manufacturers regarding the absorption time of their product in human tissues. Some of these firms attempt to judge this time by the results of animal experiments. Others periodically test their products for loss of tensile strength after contact with proteolytic enzymes in test tubes. Still others assume that by chromicizing catgut in a certain way for a certain length of time it will satisfactorily withstand absorption for a sufficient time to permit wound healing. Some catgut firms state that their product will hold the tissues for 10, 20, or 40 days. Others claim that their

[1] From the Bacteriological Research Laboratory of the Surgical Department of the College of Physicians and Surgeons, Columbia University, and the Presbyterian Hospital, New York.

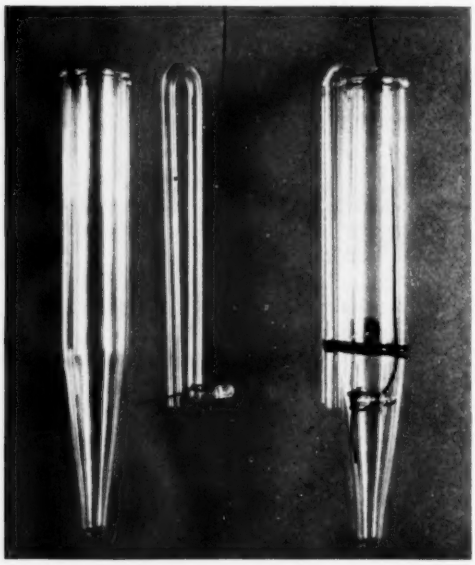

Fig. 1. Method of attaching catgut to glass rod by a slip knot. At the right, the rod has been fastened to the centrifuge tube by an elastic band.

catgut will resist complete absorption for that length of time, which is quite a different thing. Others only go so far as to state that their product is hard, medium, or soft. In other words there is no standardized test for catgut absorption, and the frequency of disruption of wounds sutured with catgut indicates that it is a matter of considerable importance.

During the last three years a committee of the American Medical Association has tried to get the catgut manufacturers to agree upon a standard test for catgut absorbability, but the manufacturers have apparently been unable to come to an agreement. Obviously this must be a test tube laboratory determination, in order that it may be applied periodically under controlled conditions to a large number of specimens; and, in order to prove its worth, an attempt must be made to correlate such a test with certain observations of absorption in human tissues or in animal tissues. It is with these things in mind that we offer this preliminary report of a method which is accurately controlled and will be adaptable to standardization.

This method consists of subjecting a strand of the catgut to the digesting action of a standard trypsin solution. This is prepared by adding 2 per cent by weight of trypsin powder to a buffer[1] solution of primary potassium phosphate, and secondary sodium

[1](94.5 c.cm. of M/15 Na_2HPO_4)
(5.5 c.cm. of M/15 KH_2PO_4)

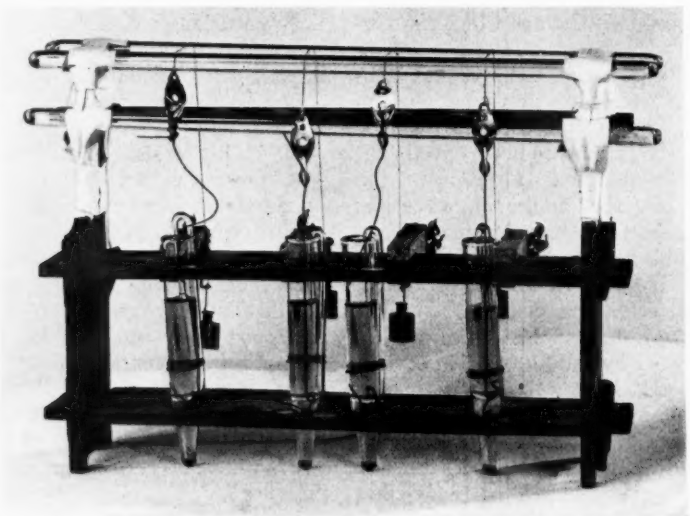

Fig. 2. Front view of the special test tube rack.

phosphate at a hydrogen ion concentration of 8. The same brand of trypsin should be used consistently as there is some variation in the efficiency of the various commercial products.[1] A slip knot is made on the end of a strand of the catgut and this is placed over the shank of a glass rod (Fig. 1). This is done rather than tying a simple knot which fractures some of the fibers, particularly if the gut is brittle. The glass rod and the attached catgut are then inserted into a centrifuge tube containing 10 cubic centimeters of the digesting media. This allows 4 centimeters of the catgut to be exposed to the media. A rubber band is used to hold the glass rod to the centrifuge tube. This is placed in a special test tube rack (Fig. 2) and the free end of the catgut is attached to a clip so that contact is made at a switch on the opposite side of the test tube rack. (Fig. 3 shows the switch mechanism with two strands broken and two unbroken, making contact.) A diagram of the mechanism is shown in side view in Figure 4. A 20 gram weight is attached to the opposite side of the switch to exert constant tension. The entire apparatus is set up in the incubator and kept at a constant temperature of 37.5 degrees C. The switches are connected with corresponding electric

[1] "Difco" trypsin was used in all of our experiments.

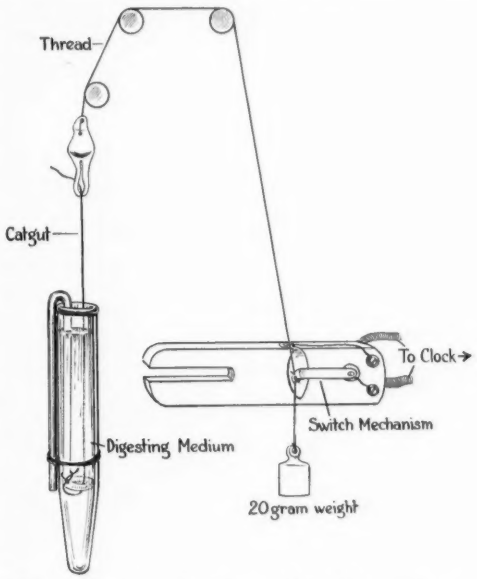

Fig. 4. Diagrammatic representation of the apparatus.

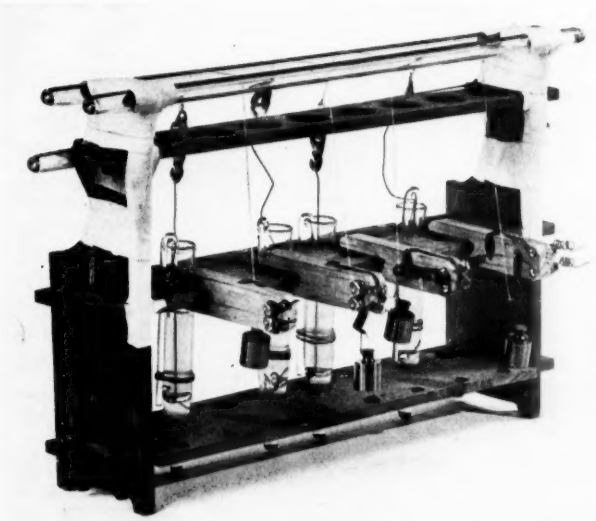

Fig. 3. Rear view showing the switch mechanism. The second and fourth strands have been digested, allowing the weight to fall which interrupts the contact.

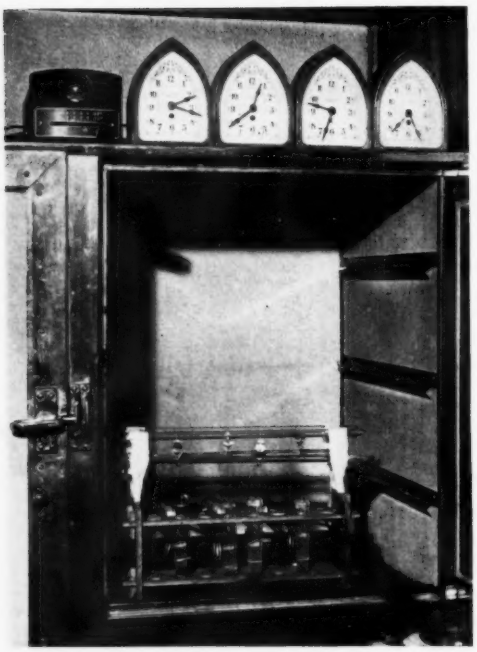

Fig. 5. Photograph of complete setup in the incubator showing the recording clocks above.

clocks so that when the circuit is broken the time will be automatically recorded (Fig. 5). As is shown, four determinations may be made at one time with this apparatus, but the number may be easily increased.

RESULTS

It is not our purpose to report fully the digestion rates of various sizes of plain and chromic catgut produced by ten leading American and foreign ligature producers, which we determined by this method. However, some of the more significant results are presented to stimulate further investigation.

1. Differences have been found in the rate of digestion of the catgut produced by ten leading catgut manufacturers, but the products of each firm have shown a fairly constant rate of digestion.

2. Catgut produced by two foreign ligature manufacturers resisted digestion longer than any sample supplied by domestic manufacturers.

3. Non-boilable catgut consistently resisted digestion longer than the boilable variety.

4. Non-sterilized catgut resisted digestion longer than any form of sterilized catgut except that produced by the foreign manufacturers.

CONCLUSIONS

A method for determining the time of catgut digestion *in vitro* is described, which is simple, containing the elements of physiological digestion but having its variables controlled and having an accurate method of determining its end point. We believe that catgut manufacturers should attempt to standardize their products by a method similar to this, rather than on the amount of chromic acid in the gut or on inaccurate animal experiments. We also feel that this test will act as a guide to ligature producers who are attempting to produce a superior type of suture which may be depended upon to resist digestion in operative wounds until all possibility of disruption has passed, and will thus reduce the incidence of this catastrophy.

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MESENTERICOPARIETAL HERNIA

Duodenal Hernias of Treitz

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In 1776, Neubauer reported an "exceptionally rare case of a peritoneal hernial sac holding all of the small intestines." From his description and illustrations we might now place his case under the classification of left duodenojejunal hernia. Following this case report there were other cases scattered throughout the literature reported by Bordenave, Monro, Cooper, Curveilhier, etc., but it was not until the publication of the great work of Treitz, in 1857, that their true significance was suspected. It was Treitz who gave us the first accurate description of the fossæ about the duodenojejunal juncture, the "vascular arch of Treitz" and the earliest theory of the origin of duodenal hernias.

ETIOLOGY

Most of the subsequent studies (Barrs, Broesike, Bramlett and Ashhurst, Brown, Carson, Cofer and Phillips, Davis, Dayton, Desjardin, Deaver, Erdely, Grad, Hallock, Harris, Levin, Heller, Huntington, Lazarus and Rosenthal, Long, Lower and Higgins, Masson and McIndoe, Morton, Moynihan, Nagel, Novak, Nuzum, Phillips, Pidcock, Primrose, Pringle, Sumner, Short, Taylor) of duodenojejunal hernia have been based on or modified from the original investigations of Treitz, who explained the occurrence of the fossæ about the duodenojejunal flexure as due to the failure of complete fusion of the peritoneal leaves during the process of rotation. Treitz believed that these fossæ were deepened and widened by the pressure and peristaltic movement of the intestines to such a degree as to produce a true hernial sac.

Waldeyer (1868), on the other hand, considered the elevation of the peritoneum by blood vessels (inferior mesenteric vein and left colic artery) as the important factor. Toldt explained them on the basis of physiologic adhesions, while Treves in his Hunterian Lectures, attempted to explain the potential hernia sac as remains of the early folds of the mesoduodenum. Moynihan, in his splendid monograph on retroperitoneal hernia, attributes their production to a failure of the root of the mesentery to unite with the posterior abdominal wall. Nixon, moreover, thought that they might be produced by traction folds.

It has been the belief of most authors that these so called duodenojejunal hernias were post-fetal developments, by a herniation of the intestine into a preformed paraduodenal or retroduodenal fossa. Nine separate and discrete fossæ have been described about the duodenojejunal flexure from the work of Huschke, Treitz, Gruber, Lanzert, Jonnesco and Broesike introducing into the medical literature a very puzzling nomenclature. In spite of the finding of these hernias in a newborn child by Vogt, in a child of 14 days by Broesike, and in a child of 2 months by Treitz, the possibility of their interpretation on an embryological basis was never considered until the relatively recent works of Andrews, Eisler and Fischer, and Bender. In 1923, E. Andrews after observing a case of so called duodenal hernia raised the point that the term duodenal hernia was a "misnomer." He advanced the view that the condition was a congenital anomaly due to the imprisonment of the small intestine beneath the mesentery of the developing colon. Andrews, in his argument, states, "the view that these small peritoneal pouches of which there are hundreds scattered about the abdomen are the origin of these hernias is absurd and grotesque." In support of his views he advanced the following facts:

1. "Differential pressure is completely lacking within the abdomen so that any *vis a tergo* to account for the formation and growth of such hernias is totally absent.

2. "There are literally hundreds of similar folds and fossæ in the abdomen many of

which are of greater size and they are practically never the site of hernias.

3. "In all but a very small minority of the cases reported, the degree of herniation has been total or subtotal.

4. "Vogt reported a case in which such a hernia was total in a newborn infant.

5. "Herniated viscera are never anything but small bowel. The presence of omentum has never been noted."

In the German literature Heller stresses that Bender is the first to bring forward a new concept with regard to internal hernia, which is based chiefly upon the researches of Eisler and Fischer. They connect the start of a large internal hernia of Treitz with the failure of adhesion during fetal life of the mesentery of the large intestine to the parietal body wall. It was Eisler and Fischer and Bender who applied the term mesentericoparietal hernias to this condition. Hertzler is also extremely doubtful that the gut ever pushes its way into one of these fossæ, there being no greater pressure within the abdomen than in the potential sac, as is the case of hernias through the abdominal wall. He also feels that it is far more probable that in the rotation of the colon, descent of the cæcum and fusion of the right and left portions of the large intestine with the posterior abdominal wall, part or all of the small intestines are left in a retroperitoneal pocket.

In order to understand the production of these hernias, it is necessary to grasp the basic embryological changes in the development of the gastro-intestinal tract. As is well known, it is at an early stage divided into the foregut, midgut, and hindgut; supplied respectively by the cœliac axis, superior mesenteric artery, and inferior mesenteric artery; and having the respective functions of digestion, absorption, and excretion. In the evolution of this primitive arrangement into the completed alimentary tract, the intestinal viscera go through a series of rotations and fixations. According to Dott the abdominal portion of the alimentary canal may suffer a large number of perversions during its development. The incidence of the essential errors of disposition is confined almost entirely to the midgut.

Normally during the fifth week of fetal life when the yolk vesicle and vitello-intestinal duct become of less importance and begin to degenerate, the developing intestines are no longer pulled outward into the umbilical cord. But, due to their duodenocolic attachment to the posterior abdominal wall, they are drawn back into the abdominal cavity as the embryo elongates and the abdomen enlarges. The phenomena of rotation occurs simultaneously with the replacement of the intestines into the abdomen. The first stage rotation includes the rotation of the liver, stomach, duodenum, and pancreas through an angle of 90 degrees into their permanent positions. During the second stage rotation of the midgut takes place on the superior mesenteric artery as an axis through an angle of 180 degrees; the prearterial segment normally being carried behind the cæcum and coming to lie in the abdominal cavity in front of the mesentery of the hindgut. During the latter part of the second stage the cæcum is drawn within the abdomen and comes to lie first just to the left and above the umbilical orifice, and later just under the liver. The third stage is characterized by the further descent of the cæcum and by the fixation of certain portions of the intestine to the posterior abdominal wall by fusion of their mesentery with the posterior parietal peritoneum. By the twelfth week the mesenteries of the ascending colon and descending colon have become obliterated by fusion to the posterior parietal peritoneum. A portion of the post-arterial mesentery remains as the transverse mesocolon while the prearterial mesentery remains essentially free attaching only along its base as the root of the mesentery. To recapitulate, normally the colon grows across the abdomen superiorly and then down, thus avoiding imprisoning the small intestine in its mesentery.

According to Andrews, "if no rotation of the umbilical loop of the midgut occurs or if rotation occurs through an angle of 180 degrees in the reverse direction, the cæcum would then come to lie in the lower abdomen to the right of the midline. The colon at first runs straight to the rectum. As it gains in length it forms a loop and when the cæcum seeks its normal primitive position in the left

upper quadrant the small bowel is caught beneath the mesentery of the colon." This is the new embryological concept of the mode of origin of the left duodenal hernia. (See accompanying diagrams.) In short, it is produced during fetal life by the incarceration of the small intestines behind the leaves of the mesentery of the colon, which are thereby prevented from becoming obliterated by fusion against the posterior parietal peritoneal wall. As Garber recognized, the key to the solution of the mode of production of these hernias lies in the careful dissection and description of the inferior mesenteric vein and artery. Unfortunately, in the description of the greatest number of cases reported there is no accurate description as to the course of the blood supply. Since most of these cases have in the past been encountered either in operating upon a seriously obstructed patient or in a routine postmortem examination, little attention could be paid to anatomical details.

DESCRIPTION OF CASES

Recently an opportunity was presented to us to work out carefully the anatomical details of 2 cases of so called duodenojejunal hernias of Treitz, which were found in the routine dissection of cadavers in the Department of Anatomy at the Medical College of the University of Cincinnati. Our curiosities were aroused and careful detailed dissections were made in the attempt to solve the controversy as to their etiology.

CASE 1. P. P., male, negro, entered the hospital with a history of shortness of breath for 7 years. Recently dyspnœa became more severe. Patient died 36 hours after entering the hospital. No history suggestive of chronic or acute intestinal obstruction was elicited. Physical examination revealed positive findings limited to heart, lungs, and peripheral vessels. Diagnosis: general vascular sclerosis, cardiac decompensation, bronchial asthma.

When the abdomen was opened and the omentum raised, a large, globular mass about the size of a man's head was noted to occupy all of the left side of the abdomen, extending to the right well beyond the midline (Fig. 1). The exact measurements of the mass were 15 by 20 by 12 centimeters. On closer examination it was noted that this mass was really a sac containing all of the small intestine except for 5 to 6 centimeters of terminal ileum. The wall of this sac was as smooth and glistening as the parietal peritoneum. It was translucent and through it could be noted the outline of the incarcerated small intestine. The distal two-thirds of the transverse colon and all of the descending and iliac colon were incorporated in the anterior and lateral walls of the sac. The colon in the left upper quadrant was noted to be lower than the hepatic flexure, the normal splenic flexure being entirely absent. The distal transverse colon and descending colon were contracted. The iliac and sigmoid colon were extremely redundant due to the anterior displacement of the distal colon by the hernial sac. They occupied the lower portion of the right iliac fossa and pelvis. The cæcum, ascending colon, and hepatic flexure were essentially normal except for their relatively large size. The greater part of the appendix lay retrocæcal except for its tip which dipped over the pelvic brim. A firm band-like adhesion was noted to extend from the sac to the ileocæcal region, inferior and posterior to which could be seen the terminal ileum as it coursed from the posterolateral wall of the sac to enter the cæcum. Just at this point a small cul-de-sac (which just admitted one finger) was found extending about 4 centimeters into the sac. But at no point could any aperture or opening be discovered connecting the interior of the sac with the remainder of the abdominal cavity.

On dissection of the sac the anterior wall was noted to be made up of two serous layers (Fig. 2) between which coursed the ascending and descending branches of the left colic artery and vein as they ran across the sac from right to left to their ultimate distribution on the descending colon (Fig. 5, Case 1). When the inner serous layer of the anterior wall was cut through the contents of the small intestine were exposed. The posterior wall was composed of only one peritoneal layer which continued on to the left lateral wall as one of the peritoneal layers of the sac as far as the descending colon, the other peritoneal layer being derived from a reflection of peritoneum from the lateral abdominal wall. All of the jejunum and practically all the ileum lay distributed in their normal positions within the sac. The entire small intestine was normal as to size and was covered with glistening peritoneum. Adhesions were conspicuous by their absence. The duodenojejunal junction was found just to the left of the body of the second lumbar vertebra, and was held in place by the ligament of Treitz and a superior duodenomesocolic fold, the latter marking out a superior paraduodenal fossa. No definite inferior fold was noted. Upon resection of the jejunum and ileum close to the point of attachment of their mesenteries, the root of the mesentery was found to occupy essentially its normal position, extending from the duodenojejunal flexure to a point just medial to the right sacro-iliac point. The distribution of the superior mesenteric artery and vein was normal, but upon working out the course and distribution of the inferior mesenteric vessels we found the following anomalies.

The inferior mesenteric artery was noted to arise from the aorta 5 centimeters from its bifurcation, to

Fig. 1. The mesentericoparietal hernia sac in Case 1, with no opening into the sac other than the incision to expose its contents—the small intestine. Incorporated in the anterior and lateral walls of the sac are the distal transverse and descending colons.

course downward and to the right following close to the attachment of the root of the mesentery, giving off in turn the superior hæmorrhoidal branch, two sigmoid, arteries and then the left colic branch (Fig. 2). The left colic artery then passed down and around the root of the mesentery, thence anterior to the terminal ileum on to the lateral and anterior wall of the hernial sac where it lay in between the two peritoneal layers. As it reached the anterior wall it divided into an ascending and descending branch, which were distributed to the descending colon. There were two sigmoid arteries. It was found that the proximal sigmoid colon was supplied by what appeared to be the distal sigmoid artery, while the distal sigmoid colon was supplied by the proximal sigmoid artery. This distortion was produced by the same mechanism (the distention of the hernial sac by its contents) which changed the course of the left colic artery.

The superior hæmorrhoidal vein was found coursing up from the rectum in its normal position until it reached the proximal sigmoid artery about which it curled and coursed downward, following the left colic artery under the root of the mesentery, close to

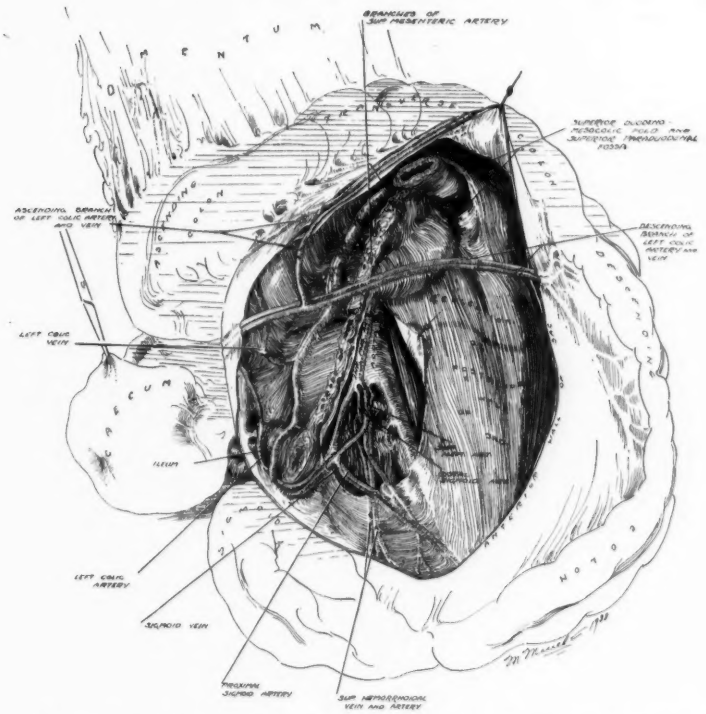
BRANCHES OF SUP. MESENTERIC ARTERY
SUPERIOR DUODENO-MESOCOLIC FOLD AND SUPERIOR PARADUODENAL FOSSA
ASCENDING BRANCH OF LEFT COLIC ARTERY AND VEIN
DESCENDING BRANCH OF LEFT COLIC ARTERY AND VEIN
LEFT COLIC VEIN
ILEUM
LEFT COLIC ARTERY
SIGMOID VEIN
TRANSVERSE SIGMOID ARTERY
SUP. HEMORRHOIDAL VEIN AND ARTERY

Fig. 2. Dissection of the sac in Case 1, showing the normal superior paraduodenal fossa and the peculiar distortion of the blood supply to the distal colon.

which point the sigmoid vein entered it. It then ran upward along the right side of the root of the mesentery to pass through the posterior wall of the upper portion of the sac to join the splenic vein at its usual point of junction.

CASE 2. W. J., colored, aged 24 years, was admitted to the Branch Hospital September 7, 1933. He died October 4, 1933. He had lost weight. Physical examination and X-ray films revealed a large advanced tubercular lesion of the left lung of the basal type. A mass was noted in left upper quadrant which moved with respirations and was thought to be an enlarged spleen. There was no history whatsoever of gastro-intestinal disturbance.

The abdomen was opened and the liver and stomach were found to be normal as to size and position. The omentum was raised and the large intestine was seen to occupy chiefly the right side of the abdomen while the left side of the abdomen was filled with an elliptical mass about the size of a football (Fig. 3). The exact measurements of the sac were 18 by 24 by 13 centimeters. The mass was found to be a large peritonealized pouch which contained all of the small intestine with the exception of 7 centimeters of terminal ileum, the wall of the sac was smooth and glistening and was made up of 2 layers of peritoneum (Fig. 5, Case 2) in the folds of which lay the greater portion of the transverse colon and descending colon. There was no definite orifice or aperture into the sac. The terminal ileum passed out from the posterolateral aspect of the hernial sac to enter the cæcum. There was a band-like adhesion noted to extend from the sac to the midpoint of the ascending colon. The cæcum, ascending colon, and hepatic flexure were essentially normal. The course of the transverse colon was very short for it soon angulated and coursed downward on the right of the summit of the sac. As a result of being carried forward beyond the summit of the hernial sac, the iliac and sigmoid colon were especially redundant. The appendix lay retrocæcal.

The jejunum and ileum were about normal as to size and length. The duodenojejunal flexure was normal, with its ligament of Treitz and superior duodenomesocolic fold, which marked off a superior paraduodenal fossa. The root of the mesentery was shorter and its direction was not as oblique as normal, extending from the left aspect of the second lumbar vertebra to the right aspect of the lower portion of the body of the fourth lumbar vertebra. Both the inferior mesenteric artery and vein lay to the right of the root of the mesentery in the right

Fig. 3. The mesentericoparietal hernia sac in Case 2 containing most of the small intestine, with the transverse and descending colons carried forward and to the right of the summit of the sac.

posterolateral wall of the hernial sac, the artery lying behind the terminal ileum while the vein lay in front, giving off their left colic branches which coursed over the sac in between the two serous layers to their ultimate distribution on the descending colon. The sigmoid and superior hæmorrhoidal vessels coursed under the posterior peritoneal layer, forming the posterior and inferior walls of the sac. For further description see Figures 4 and 5.

The anterior and lateral walls of the sac were composed of two peritoneal layers, while the posterior layer was composed of only one serous layer (see Figs. 4 and 5, Case 2). The internal surface of the sac was smooth and there was a striking absence of any adhesions. The pouch extended upward under the colon to the line of fusion of the mesocolon along the body of the pancreas. There was no point of communication with either the lesser or greater peritoneal sacs. The bed of the sac was formed by the bodies of the second to the fifth lumbar vertebræ, the aorta and inferior vena cava, the third portion of the duodenum, the left psoas and quadratus lumborum muscles, and the lower pole of the left kidney.

EMBRYOLOGICAL EXPLANATION

The significant findings in these two cases which lead us to consider them as true congenital anomalies rather than post-fetal developments, are as follows: the site and extent of the sacs, the absence of any definite neck, and the absence of both an entering and a departing loop, along with the absence of any omentum within the sac. The dissection of the sacs and the peculiarities of their blood supply served to clinch the point in question. Also,

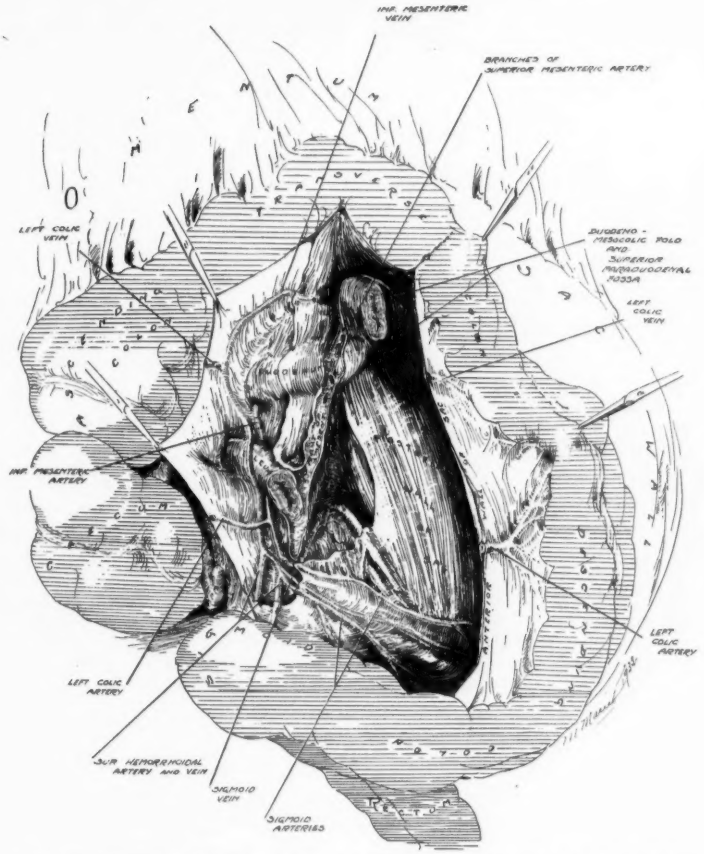

Fig. 4. Dissection of the sac in Case 2, showing the displacement of both inferior mesenteric artery and vein to the right of the root of the mesentery and the normal superior paraduodenal fossa.

the finding of normal duodenal jejunal fossæ serves to exclude the mechanism of a widening and deepening of a preformed paraduodenal fossa in these cases.

The embryological sequence of events is as follows: During the second stage of rotation, if the rotation occurred through an angle of 180 degrees in the reverse direction, the cæcum will be thrown behind the prearterial segment, while the latter is thrown upward into coils in the left upper quadrant. The colon at first runs straight to the rectum. As it lengthens, it forms a loop (see Fig. 7, diagram B) and when the cæcum seeks its normal position just to the left and above the umbilicus the small bowel is caught behind the mesentery (diagram C) of the colon, thereby forming the two layer anterior wall of the sac. The descending colon later fuses along the posterior abdominal wall. Depending on the extent to which the incarcerated intestines extend and develop under the mesentery of the colon, to that extent will be determined the distortion of the blood supply and also the size of the sac.

In Case 1 the small intestine must only have extended down as far as the left colic branch of the inferior mesenteric artery (Fig. 7). As the hernial contents increased in size the wall of the sac stretched, thereby throw-

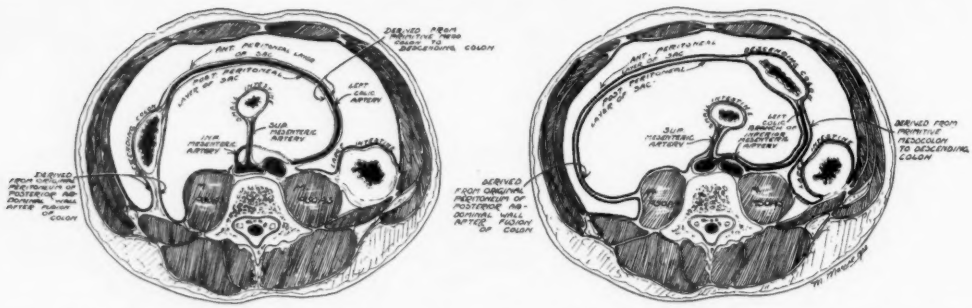

Fig. 5. Cross sections at approximately the level of the fourth lumbar vertebra in Cases 1 and 2 showing the relative portions of the sac wall derived from the primitive mesocolon to the descending colon, and from the posterior parietal peritoneum.

ing the left colic artery first under the root of the mesentery, thence over the lateral and anterior wall of the sac to its ultimate distribution to the descending colon. Furthermore, the distortion of the blood supply to the sigmoid colon so that what appeared to be the distal sigmoid artery supplied the proximal sigmoid colon serves to bear out the same point. The diversion of the course of the inferior mesenteric vein so that it courses upward on the right side of the root of the mesentery (when normally it should lie on the left), serves to prove the same point. The left lateral wall of this sac is formed by the stretching of the peritoneal layers reflected from the posterior abdominal wall on to the descending colon, as brought about by the increase in size of the hernial contents (Fig. 5).

In Case 2 the small intestine must have extended beneath the entire mesocolon of the hindgut thereby throwing the inferior mesenteric artery and vein with all of their branches to the right of the root of the mesentery (see Fig. 8). The greater size of the hernial contents (small intestine) in this case along with the fixation of that portion of the sac wall derived from the mesocolon by all the branches of the inferior mesenteric artery, may have accounted for the greater stretching of that portion of sac wall derived from reflection of peritoneum from posterior abdominal wall onto descending colon (Fig. 5, Case 2).

DIAGNOSIS

To date 140 cases of duodenojejunal hernia (35 cases of right duodenal hernia and 105 cases of left) have been reported in the literature. Of these only 5 have been diagnosed correctly before operation; one by Abraszow, two by von Haberer, one by Vautrin, and one by Slaudenmeyer.

As to the clinical course the condition may remain symptomless and be found only at necropsy. On the other hand, there may be present a history of intermittent attacks of colic-like abdominal pain, without vomiting, suggesting a chronic obstruction. Then again, there may be no trouble until the sudden onset of an acute obstruction. Rare cases present symptoms like those of a chronic duodenal stasis.

According to Garber, the history of periodic distention of the abdomen associated with a sense of heaviness, when coupled with the finding of a tympanitic elastic tumor in the left hypochondrium is very suggestive of partially obstructed duodenal hernia. In the stage of acute obstruction the signs of ileus along with the presence of an elastic tumor help to establish the diagnosis. It is claimed by Sheele that the roentgen-ray is of some aid in reaching a diagnosis. X-ray films following a barium meal show retention in the stomach and duodenum along with a bow-shaped closing off of the upper intestinal shadow.

TREATMENT

Very little can be said as to treatment. If acute obstruction exists, an abdominal laparotomy must be performed after the proper preoperative preparation with decompression and restoration of the fluid and acid base balance.

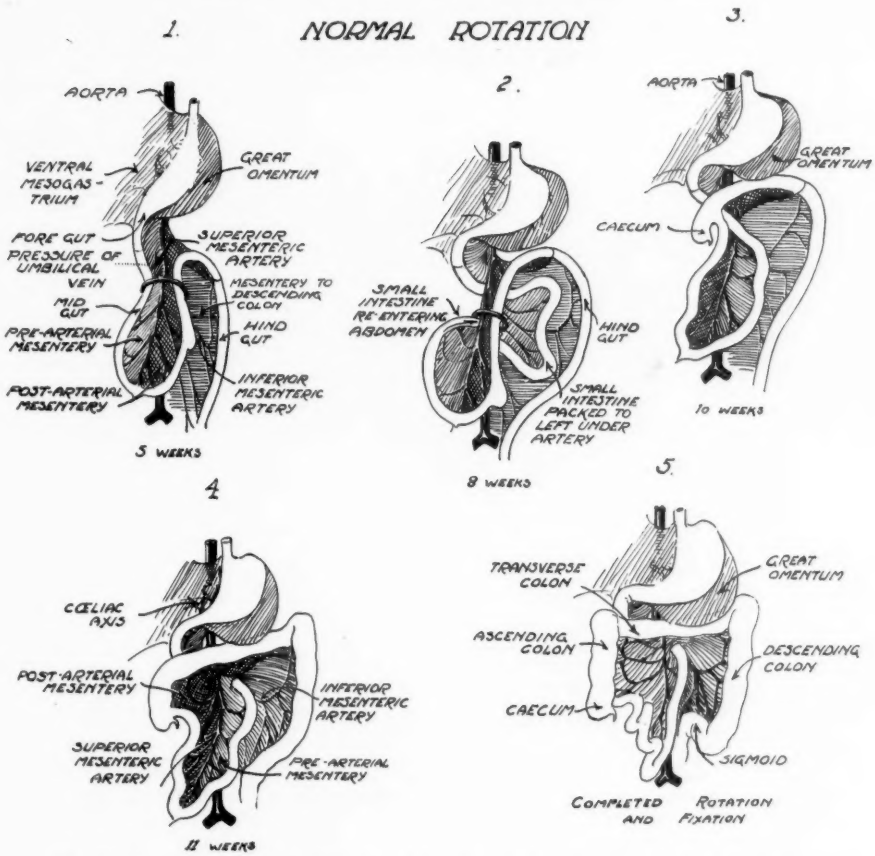

Fig. 6. The normal rotation and fixation of the abdominal portion of the gastro-intestinal tract.

The extent of the procedure will depend largely upon the status of affairs found. The strangulation must be relieved. This may be done by widening the mouth of the sac followed by a partial resection of the sac if the vessels permit. Because of the technical difficulties produced by the distortion of the anatomy, the mortality still remains high. This can be reduced only by a more thorough grasp on the part of the operating surgeon of the anatomical anomalies at hand.

SUMMARY

In 1776, Neubauer described a peritoneal hernial sac within the abdomen which contained all of the small intestine. Subsequently other cases were reported, but it was not until the great work of Treitz, in 1857, that the subject of duodenojejunal hernias might be said to exist. Treitz gave us the first concept as to their etiology, believing them to be produced by the pressure and peristaltic movement of the small intestine widening and deepening one of the many preformed fossæ about the duodenojejunal flexure.

Most of the subsequent studies were either based directly on or modified from the work of Treitz. Though these hernias were reported in newly born infants the possibility of their interpretation on an embryological basis was never considered until the relatively recent works of Andrews, Eisler and Fischer, and

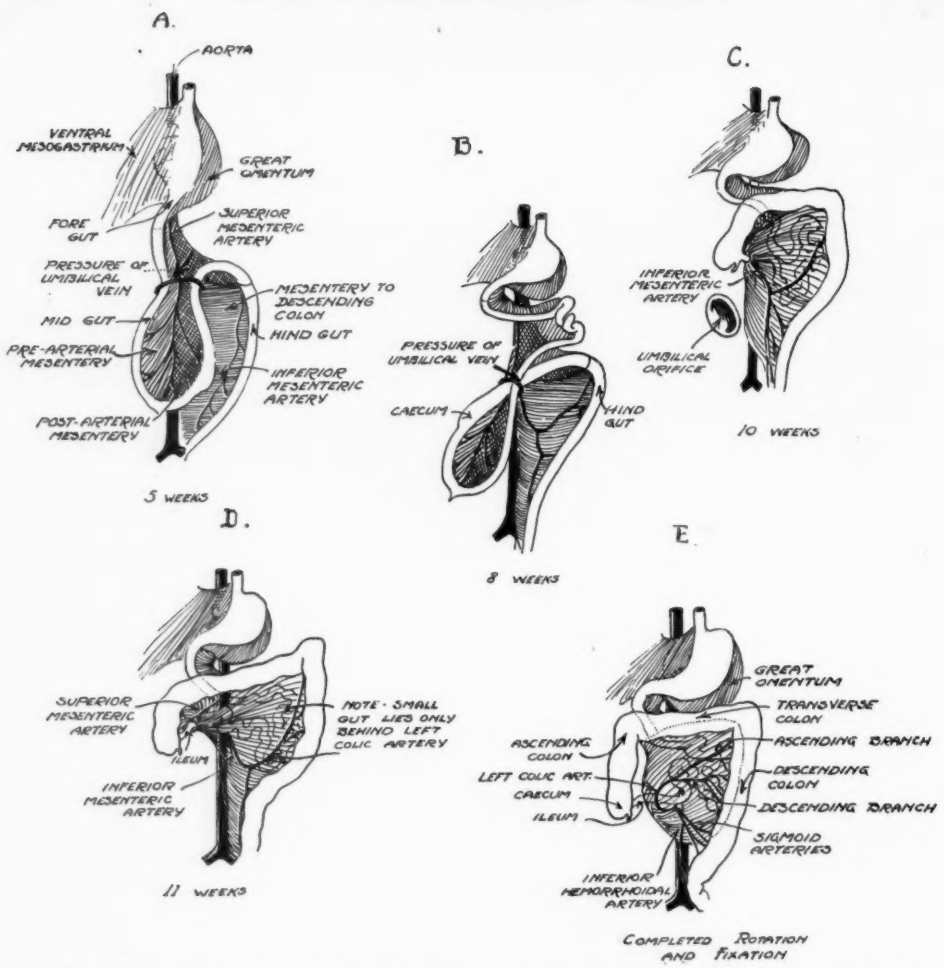

Fig. 7. The embryological sequence of events explaining the formation of the mesentericoparietal hernial sac in Case 1 with the resulting distortion of the blood supply.

Bender. They present the rational explanation that these internal hernias are congenital anomalies produced by the imprisonment of the small intestine beneath the mesentery of the developing colon. Against the old concept of the hernia produced by a widening and deepening of a preformed pouch are the following facts: (1) differential pressure is completely lacking in the abdomen; (2) there are literally hundreds of similar fossæ in the abdomen; (3) in all but a few cases the herniation has been total or subtotal; (4) the herniated viscera are never anything but small intestine. Omentum has never been found in the hernial sac.

The basic embryological changes in both the normal and abnormal development of the abdominal portion of the gastro-intestinal tract are presented. Normally, the colon grows across the abdomen superiorly and then down, thus avoiding imprisonment of the small intestine in its mesentery. If, however, the rotation of the umbilical loop is reversed, the small intestine is incarcerated behind the

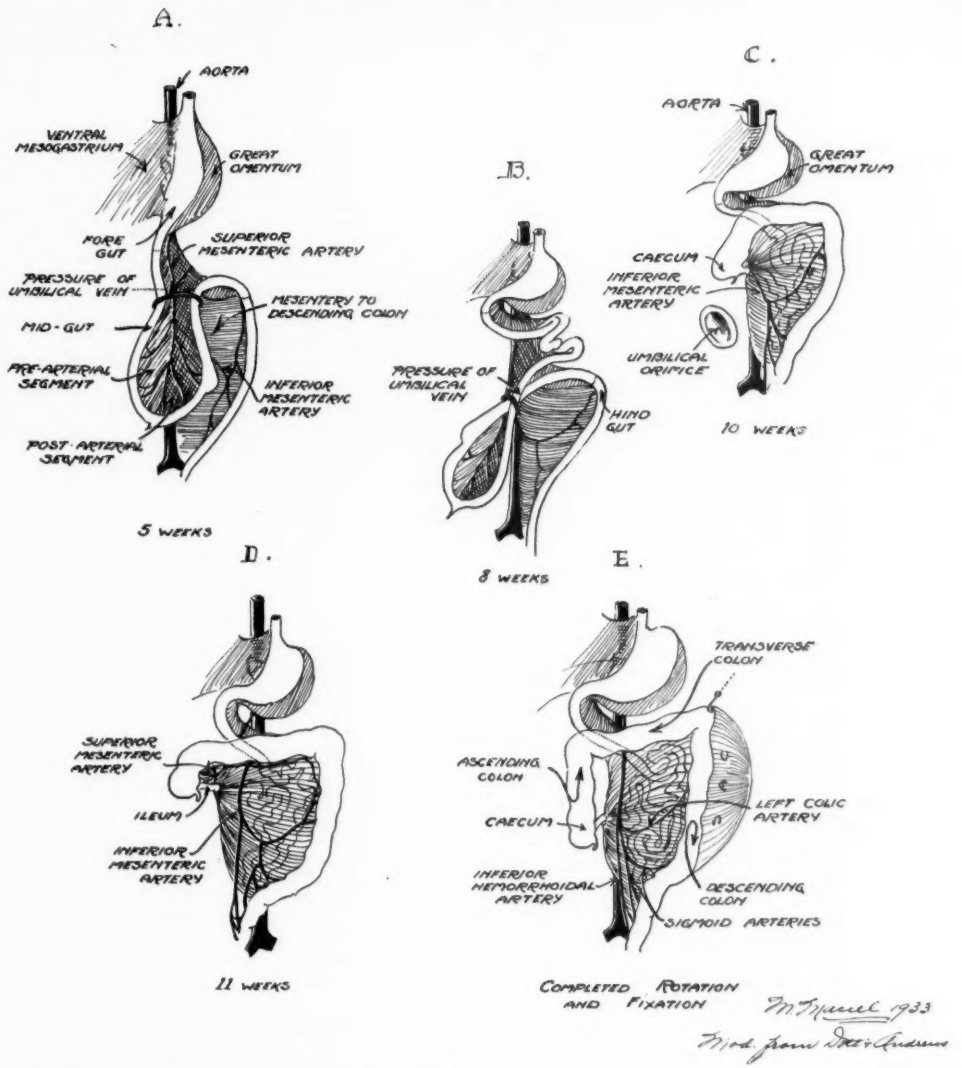

Fig. 8. The course of events explaining the production of the hernial sac in Case 2 with the consequent distortion of the blood supply.

leaves of the mesentery of the colon, which forms the greater portion of the wall of the hernial sac (see accompanying diagrams).

As Garber recognized, the key to the solution of the mode of production in these hernias lies in the careful dissection and description of the inferior mesenteric artery and vein. Unfortunately, in the description of the greatest number of these cases there is no accurate description of the course of the blood supply. Recently, 2 cases of so called duodenojejunal hernias of Treitz were encountered in the Department of Anatomy, upon which careful, detailed dissections were made.

The significant findings in these 2 cases, which lead us to consider them as true con-

genital anomalies rather than post-fetal developments, were as follows: (1) the site and extent of the sac; (2) the absence of a definite neck; (3) the absence of omentum within the sac; (4) the distortion of the blood supply to the colon. This last point served to clinch the point in question.

To date 140 cases of duodenojejunal hernias have been reported in the literature. Clinically, they may present no symptoms whatsoever or they may present the signs of acute or chronic intestinal obstruction, which requires operative relief. The mortality of this procedure still remains high. This can be reduced only by a more thorough grasp on the part of the operating surgeon of the anatomical anomaly at hand.

CONCLUSIONS

1. In the light of the new embryological concepts the anatomical details of the cases presented indicate that the so called duodenal hernias of Treitz are true congenital anomalies, produced by the incarceration of the small intestine behind the mesentery of the colon.

2. In view of the mechanism of production of these hernias the term mesentericoparietal hernias has been applied to them.

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A STUDY OF VARIOUS KIDNEY FUNCTION TESTS IN RELATION TO THE TOXÆMIAS OF PREGNANCY

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CHRONIC nephritis is a grave and fairly common complication of pregnancy, yet it is one of the most difficult conditions to recognize in its earlier stages. An elevation of blood pressure *per se* is not sufficient evidence for making a diagnosis of nephritis as the differential diagnosis has to take into account many other conditions, such as essential hypertension, eclampsia, and pre-eclampsia. Hypertension plus albuminuria and a nitrogenous retention in the blood have been the criteria for the diagnosis of chronic nephritis, but these, more especially the latter two, usually appear so late that the damage to the kidney is irreparable. For example, MacKay and MacKay state (and we concur with them) that a patient with chronic interstitial nephritis may have a blood urea concentration within normal limits even though more than one-half the functioning tissue of the kidney has been destroyed.

Many tests have been developed for the purpose of detecting impairment of kidney function. One of the difficulties of interpretation lies in the fact that all of the tests are *not* based on the same principle. For instance, in the phenolsulphonephthalein test, a foreign substance is injected; in the creatinine excretion test one injects a substance which is normally excreted in the urine but the presence of which in the blood is questionable (1, 4), whereas the urea clearance is a measure of the amount of blood cleared of its urea in one minute.

Stander and Peckham, in their follow-up study of a large series of patients with nephritis in pregnancy, have shown that 40 per cent of these women died within 10 years after the diagnosis was definitely established. With these findings in mind, it is of utmost importance that the obstetrician should recognize kidney impairment as early as possible. It was with a desire to find which, if any, of the many kidney function tests were of sufficient sensitivity to differentiate the toxæmias of pregnancy that Stander, Ashton, and Cadden undertook a comparative study of the Mosenthal concentration test, urea concentration factor, diastase test, thiosulphate test of Nyiri, the guanidine and creatinine excretion tests of Major, the phenolsulphonephthalein test, and the urea clearance test. These authors conclude that the latter three tests proved of real value in the differentiation between mild nephritis and the other toxæmias of pregnancy, and recommended the urea clearance and creatinine excretion tests for routine use in all patients suffering from toxæmia of pregnancy in which the diagnosis is not clear.

For many obvious reasons it would be advisable to carry out only one type of test in patients in whom one suspects chronic nephritis. It was our purpose in the present study to determine which one of the three tests which have been recommended by the authors mentioned gives the most accurate evaluation of kidney function and thus could be used exclusively.

PROCEDURE

The tests were carried out in the following manner:

Urea clearance. 1. 6 a.m. The patient is awakened and the regular breakfast is served except for tea, coffee[1] or cocoa.

2. 7 a.m. A catheter is inserted as described under the phenolsulphonephthalein test. The bladder is emptied and this specimen is discarded. The patient may have 200 cubic centimeters of water.

3. 8 a.m. The bladder is emptied, the exact time is noted, and the entire specimen is sent to the laboratory. The patient may have 200 cubic centimeters of water.

4. 8:30 a.m. A blood specimen is drawn by the doctor.

5. 9 a.m. The bladder is emptied, the exact time is noted, and the entire specimen is sent to the laboratory.

[1]Page states that the urea clearance test may be carried out following the usual breakfast with coffee.

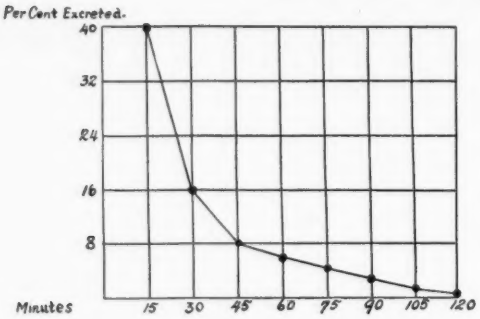

Fig. 1. Phenolsulphonephthalein test.

Note. The time is recorded from the moment that the catheter is clamped in the first hour until the catheter is clamped in the next hour. Thus if after inserting the catheter and collecting the urine the clamp is applied at 7:02 a.m. this time is regarded as the beginning of the first specimen which is to be sent to the laboratory.

Phenolsulphonephthalein test: 1. The patient has a rubber catheter inserted and the bladder is emptied. The catheter remains in place for the duration of the test. (a) The catheter is fastened to the patient's leg with adhesive tape so as to hold it in place. (b) A Kelly clamp is used to close off the catheter.

2. The bladder is emptied and 6 milligrams of phenolsulphonephthalein is given intravenously by the doctor. The patient now drinks 200 cubic centimeters of water.

3. Fifteen minutes after the intravenous injection the first specimen is collected, properly labeled, and sent to the routine laboratory. The patient is given 100 cubic centimeters of water.

4. Fifteen minutes later the second specimen is collected, properly labeled, and sent to the routine laboratory. The patient is given 100 cubic centimeters of water.

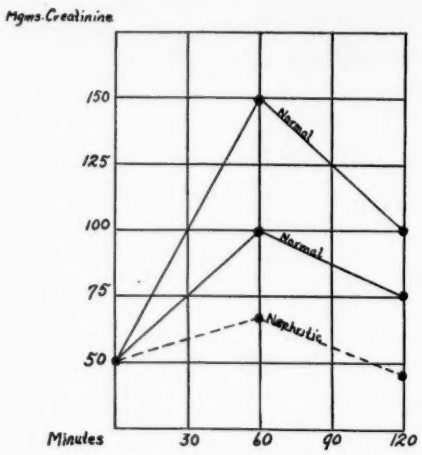

Fig. 2. Creatinine test.

5. Fifteen minutes later the third specimen is collected, properly labeled, and sent to the laboratory. The patient is given 100 cubic centimeters of water.

6. Fifteen minutes later the fourth specimen is collected, properly labeled, and sent to the routine laboratory. The patient is given 100 cubic centimeters of water.

7. Fifteen minutes later the fifth specimen is collected, properly labeled, and sent to the routine laboratory.

8. Fifteen minutes later the sixth specimen is collected, properly labeled, and sent to the routine laboratory.

9. Fifteen minutes later the seventh specimen is collected, properly labeled, and sent to the routine laboratory.

10. Fifteen minutes later the eighth specimen is collected, properly labeled, and sent to the routine laboratory.

TABLE I.—PHENOLSULPHONEPHTHALEIN TEST

Type of patient	1st half hour	2nd half hour	Total	No. of tests
Normal pregnancy				
Antepartum	50	16	77	5
Postpartum	46	23	81	12
Low reserve kidney				
Antepartum	35	24	75	68
Postpartum	44	24	83	211
Nephritic				
Antepartum	36	25	78	75
Postpartum	37	24	76	78
Pre-eclamptic				
Antepartum	25	24	74	16
Postpartum	42	27	85	28
Eclamptic				
Antepartum	12	19	61	2
Postpartum	51	19	81	8

TABLE II.—CREATININE

	1st hour	2nd hour	3rd hour	No. of tests
Normal				
Antepartum	71	152	125	11
Postpartum	57	137	145	18
Low reserve kidney				
Antepartum	56	139	110	89
Postpartum	64	165	126	186
Nephritic				
Antepartum	61	136	120	79
Postpartum	61	157	110	68
Pre-eclamptic				
Antepartum	55	125	109	16
Postpartum	62	163	100	20
Eclamptic				
Antepartum	44	89	93	2
Postpartum	57	175	101	5

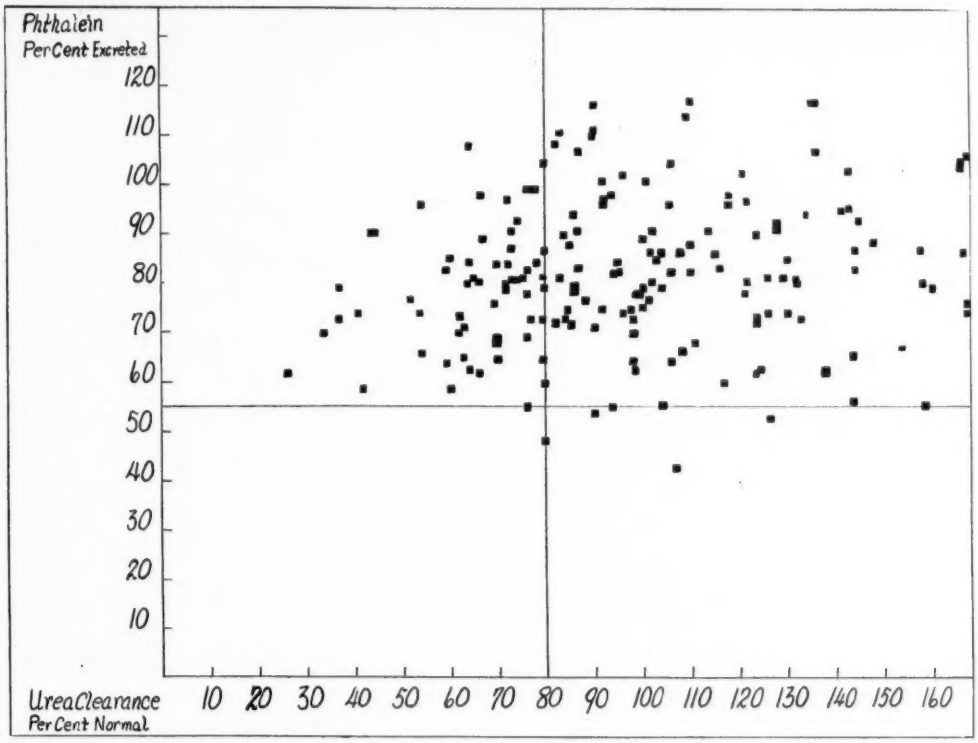

Chart 1.

Creatinine test. 1. 7:30 a.m. The patient voids and the specimen is discarded. The patient may have 200 cubic centimeters of water.

2. 8:15 a.m. Breakfast is served from floor service.

3. 8:30 a.m. The patient voids and the entire specimen is sent to the laboratory. At this time ½ gram of creatinine is given intravenously by the doctor.

4. 9:30 a.m. The patient voids and the entire specimen is sent to the laboratory. The patient may have 200 cubic centimeters of water.

5. 10:30 a.m. The patient voids and the entire specimen is sent to the laboratory.

Points to be emphasized. 1. The entire amount of urine must be sent to the laboratory.

TABLE III.—UREA CLEARANCE

	Ante-partum	No. of tests	Post-partum	No. of tests
Normal	122.7	9	104.2	11
Low reserve kidney	101.7	90	104.9	194
Nephritis	75.3	87	68.6	75
Pre-eclampsia	84.4	17	76.8	31
Eclampsia	54.7	4	79.9	14

TABLE IV.—UREA CLEARANCE TESTS

	Normal	Low reserve kidney	Nephritis	Pre-eclampsia	Eclampsia
Total number of tests	17	279	176	16	48
Tests below 80	2	64	113	10	28
Per cent of total	12	23	64	63	58
Tests below 70	2	50	89	8	21
Per cent of total	12	18	50	50	44
Tests below 65	2	40	78	8	18
Per cent of total	12	14	44	50	47
Tests below 60	2	28	57	5	14
Per cent of total	12	10	32	31	29

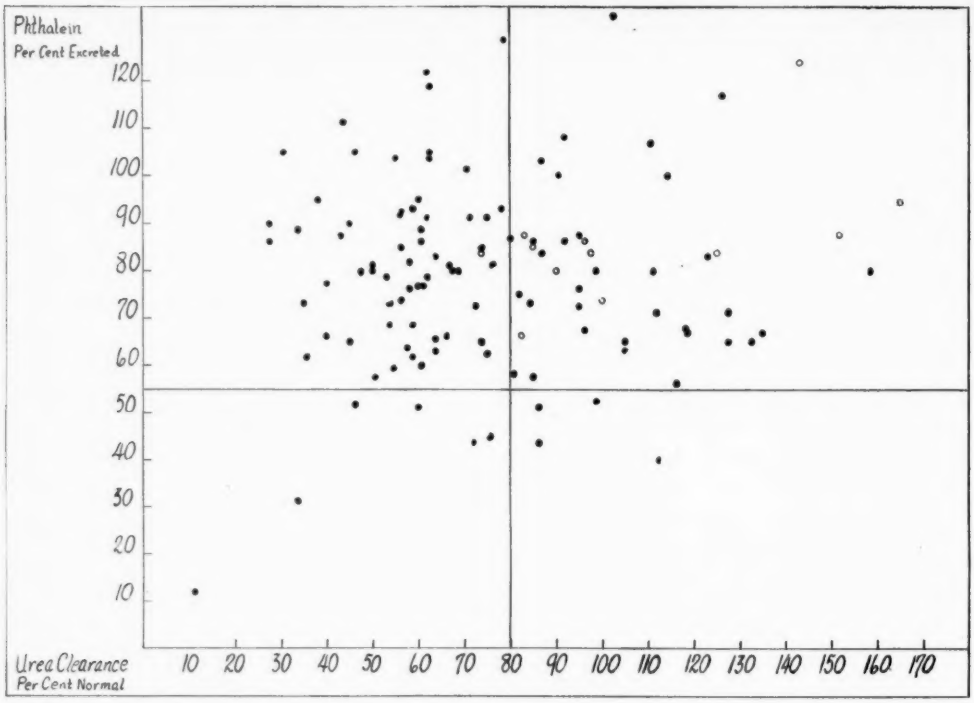

Chart 2.

2. The exact time the specimen was collected must be placed on the label.

3. Be sure that the correct label is filled out completely and correctly.

4. All medications during the interval of the tests must be stopped.

5. Avoid giving pituitrin and adrenalin.

INTERPRETATION OF TESTS

Urea clearance test. When the urine volume exceeds 2 cubic centimeters per minute the following formula is used to calculate the amount of blood that is cleared of its urea in one minute:

$$Cm = \frac{U}{B}\frac{V}{}$$

Cm—Maximum clearance
U —Urea nitrogen per 100 c.cm. urine
V —Volume of urine per minute
B —Urea nitrogen per 100 c.cm. blood.

If the output is less than 2 c.cm. per minute:

$$Cs = \frac{U\sqrt{V}}{B}$$

To express the urea clearance as percentage of normal the above formulæ are changed as follows:

$$Cm = \frac{U}{B}\frac{V}{} \times 1.33$$

$$Cs = \frac{U\sqrt{V}}{B} \times 1.85$$

Phenolsulphonephthalein test. The amount of the drug, expressed as a percentage of the total amount injected, eliminated during each quarter hour interval is recorded as shown in Figure 1. The curve plotted in this figure is normal. Any variation from this graph is an indication of deficient kidney function.

The creatinine test. The amount of creatinine excreted in each specimen is recorded as shown in Figure 2. The normal kidney should excrete two to three times as much creatinine in the first hour after injection as during the hour preceding the injection.

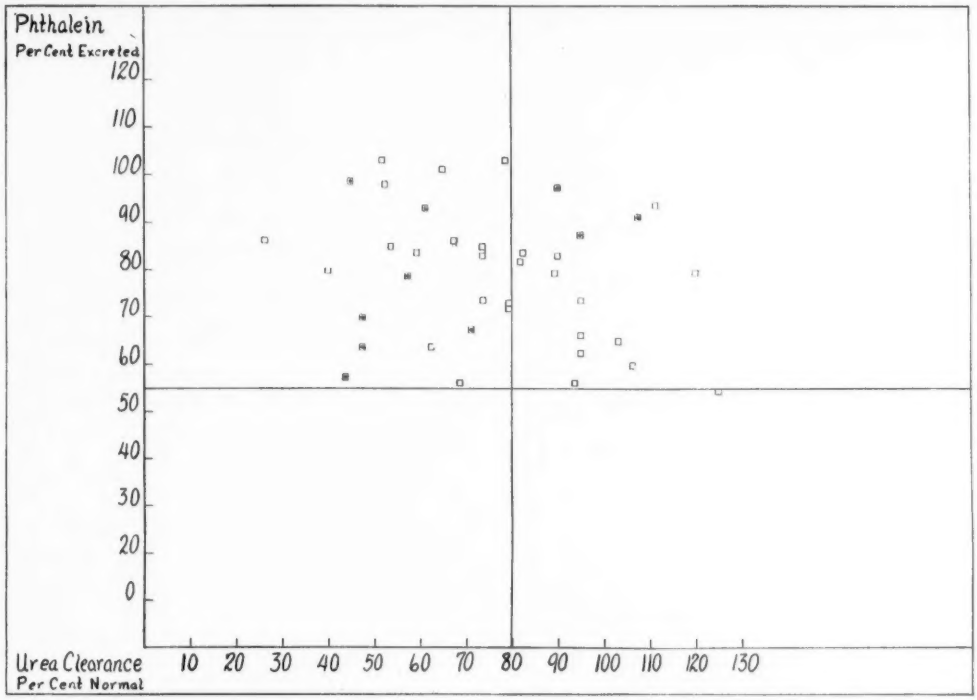

Chart 3.

RESULTS

Our results are based on the findings in—23 cases of normal pregnancy, 216 cases of low reserve kidney, 90 cases of chronic nephritis, 28 cases of pre-eclampsia, 9 cases of eclampsia.

Phenolsulphonephthalein test. In Table I are recorded the average values for the phenolsulphonephthalein test in normal pregnancy, as well as in each of the various types of toxæmia. In the normal pregnancy group, a total of 17 tests were made. Although only 5 of these were carried out before delivery, the average values agree closely with the averages obtained in the postpartum period. In the low reserve kidney group, we had 68 tests in the antepartum and 211 in the postpartum period; there is a total of 153 tests in the nephritis group, 75 of which were performed antepartum and 78 postpartum; while for pre-eclampsia and eclampsia there are a total of 54 tests.

The values in the low reserve kidney group differ somewhat from the accepted normal values which are 56 per cent for the first half hour and 14 per cent for the second half hour. The striking feature of the low reserve kidney group is the parallelism of its values with the nephritic group. As one can readily see the values are, for all practical purpose, identical. This, to our minds, invalidates the phthalein test as a means of differentiating between low reserve kidney and early chronic nephritis, and this test is perhaps of doubtful value in detecting the presence of early kidney insufficiency.

It might be pointed out, however, that the first half hour's excretion in the antepartum pre-eclampsia group is only 25 per cent. It is possible that this shows a specific inefficiency of the kidney of the pre-eclamptic that is peculiar to that condition. We are not suggesting this as a hypothesis but merely as an explanation of the solitary deviation of Table I.

TABLE V.—RELATIONSHIP BETWEEN BLOOD PRESSURE RANGE AND UREA CLEARANCE TEST

Blood pressure systolic and diastolic	Urea clearance per cent				No. of tests
	Below 80 normal	70 normal	65 normal	60 normal	
Nephritis					
$\frac{-140}{-90}$	63	49	43	36	84
$\frac{+140}{-90}$	53	41	35	29	17
$\frac{-140}{+90}$	67	61	55	33	18
$\frac{+140}{+90}$	68	53	46	28	57
Low reserve kidney					
$\frac{-140}{-90}$	20	16	13	10	232
$\frac{+140}{-90}$	33	25	17	8	12
$\frac{-140}{+90}$	23	23	23	15	13
$\frac{+140}{+90}$	50	32	23	9	22

The creatinine excretion test. The results of this test are of interest. It will be noted in Table II that in each case the kidney is more efficient postpartum except in the normal in which we have only a few tests. Here again we see the low reserve kidney and nephritic groups in agreement, while the pre-eclamptic group is slightly less efficient. Since there is so great a uniformity of values throughout the table we feel it can be safely said that the creatinine excretion test is not delicate enough to reveal kidney impairment in the early stages of nephritis.

Urea clearance. By a urea clearance test we mean the average value for two consecutive 1 hour periods. Only those tests which agreed within 10 per cent of the average value were accepted. In Table III are given the figures obtained from the urea clearance tests. Of the three tests studied, this is the only one that shows any constant and definite variation in toxæmia groups. This differs greatly from our findings for the phthalein and creatinine tests in the low reserve kidney and nephritic groups. For the former class, the average values for the urea clearance are 101.7 and 104.9 per cent normal for antepartum and postpartum, respectively, while for the nephritic group the values are 75.3 and 68.6.

From a study of 94 observations on 21 cases Bruger and Mosenthal concluded that the range of 80 to 120 per cent normal was too high. These authors suggested 75 per cent as the lower limit of normal; 50 to 75 per cent normal as doubtful range; and below 50 per cent normal as a manifestation of kidney impairment. In view of this we have considered the distribution of the test in various ranges. The figures shown in Table IV bring out quite forcibly the fact that, no matter what value below 80 is taken as the lower limit of normal, the number of nephritic patients is predominately greater below that value than any other group. Our findings agree with those of Bruger and Mosenthal. We believe that any patient showing a urea clearance persistently less than 70 per cent normal should be classified as having chronic nephritis. From the table one sees that 50 per cent of a total of 176 tests on patients diagnosed as nephritic are below 70 per cent normal in this group.

In Table V we have listed the blood pressures in four groups. The first group has a normal systolic and normal diastolic $\frac{-140}{-90}$; the second group has an elevated systolic and normal diastolic $\frac{+140}{-90}$; the third group has a normal systolic and elevated diastolic $\frac{-140}{+90}$; while the fourth group includes patients with an elevated systolic and an elevated diastolic pressure $\frac{+140}{+90}$. The urea clearance tests are recorded as the percentage of the total number of tests in each blood pressure group which is below certain limits.

An inspection of this table reveals that the distribution of the urea clearance test in respect to blood pressure is quite uniform. At first glance it may seem that the nephritic group having a normal systolic with an elevated diastolic blood pressure is inclined to give lower values for the urea clearance than any other blood pressure group. However,

this tendency disappears when urea clearance values below 60 per cent normal are considered. Except for this apparent influence of the diastolic pressure there is no relationship between the blood pressure and kidney function as measured by the urea clearance test.

RECAPITULATION

The urea clearance test was examined by Hurwitz and Ohler who found higher values in normal pregnancy than usual, reporting a figure of 127 per cent normal. This agrees quite closely with ours, namely 122.7 per cent normal. On the other hand, Cantarow and Ricchiute found that as pregnancy progressed the kidney function decreased. In the third month of gestation they obtained a value of 111 per cent normal which decreased gradually to 59 per cent normal during the ninth month. In the postpartum period they report values averaging 121 per cent normal. Practically all of our tests were made on patients shortly before and after parturition and we cannot in any way account for the material differences between our findings and those which were reported by Cantarow and Ricchiute.

In respect to the phenolsulphonephthalein test we wish to mention the findings of Van Slyke *et al.* These writers state that it is only after the urea clearance has fallen below 20 per cent normal that the two tests are in agreement. In Charts 1, 2, and 3 we have plotted the values which were obtained either on the same day or consecutive days from the urea clearance and phthalein tests. Chart 1 shows that practically all of the relative values obtained from the low reserve kidney group are in good agreement, and lie in the area of normal phenolsulphonephthalein and normal urea clearance. The circles which are plotted on Chart 2 represent normal pregnancy while the dots are chronic nephritis. In contrast to Chart 1 the majority of points representing nephritis on this chart lie in the area of normal phenolsulphonephthalein and low urea clearance which would seem to indicate that the urea clearance test is capable of revealing decreased kidney function while the phenolsulphonephthalein test has yet shown no signs of kidney impairment. In Chart 3 the dotted squares indicate eclamptic values. One sees immediately that this chart, while lacking the number of points, is practically identical with the preceding chart. These charts show graphically the greater sensitivity of the urea clearance tests as compared with the phenolsulphonephthalein test.

SUMMARY

1. We have studied the phenolsulphonephthalein, creatinine excretion, and urea clearance tests in 23 cases of normal pregnancy and in 343 women suffering from one or other type of toxæmia of pregnancy.

2. The values obtained are given in Tables I, II, III, and IV.

3. Of the phenolsulphonephthalein, creatinine excretion test, and urea clearance test, only the latter is sufficiently sensitive to differentiate chronic nephritis from the other toxæmias of pregnancy.

4. The lower limit of normal for the urea clearance test is probably in the neighborhood of 70 per cent normal.

5. The average urea clearance value for nephritis is 75 and 68 per cent normal for antepartum and postpartum, respectively.

6. Fifty per cent of all the nephritic patients showed values below 70 per cent normal.

7. There is no apparent relationship between blood pressure and kidney function as measured by the urea clearance test.

8. There is no kidney impairment, according to the urea clearance test, in the low reserve kidney group.

9. The average urea clearance values for pre-eclampsia and eclampsia are lower than those obtained in normal pregnancy.

10. We recommend the urea clearance test as the most sensitive method so far devised to recognize early or mild nephritis. To be assured that one is dealing with a nephritic condition it is essential that repeated 2 hour tests be performed.

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FRIEDMAN TEST IN HYDATID MOLE

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A NUMBER of recent reports have indicated the value of the Aschheim-Zondek pregnancy test in hydatid mole and chorio-epithelioma. A greatly increased content of prolan, or sex hormone similar to that derived from the anterior pituitary body, in the urine, is accepted as differentiating these conditions from pregnancy (10). The Friedman test for prolan, on account of its greater ease of execution, has in many quarters superseded the Aschheim-Zondek as a pregnancy test (1, 3, 5, 6, 7, 12, 13). We have been rather uncertain of what constitutes a positive Friedman test for hydatid mole, and have seen no case reports in the literature dealing definitely with this subject.

From perusal of the excellent monograph of Mazer and Goldstein (10) on clinical endocrinology, we were under the impression that the diagnosis rested upon the finding of a positive rabbit test after injection of less than 1 cubic centimeter of urine. We (2) encountered a patient 0.4 cubic centimeter of whose urine gave a positive reaction. Mole was suspected, but 10 days later she aborted a dead fetus of 5 months. Mazer (8), in a recent letter to the *Journal of the American Medical Association*, emphasizes the fact that the quantity of prolan increases with the duration of pregnancy. In the fifth month of a normal pregnancy, he states that 1 cubic centimeter of urine should give a positive rabbit test. The diagnosis of mole should not be made, he says, unless a positive reaction is obtained following the injection of one-twelfth of a cubic centimeter of a 24 hour specimen.

In a recent paper entitled "The Value of the Aschheim-Zondek Reaction in the Diagnosis and Prognosis of Chorio-epithelioma," Mazer and Edeiken (9) review the subject, and report a case. In their description of the diagnosis of their own case, the following sentence is the only reference to their laboratory studies: "Repetition of the Aschheim-Zondek test showed that as little as 1 cubic centimeter of her urine evoked a very strong reaction. The stimulated rabbit ovaries resembled a diminutive bunch of grapes . . . With the gradual decrease in the size of the metastatic tumors . . . there is a corresponding decrease in excretion of prolan, so that now, after a lapse of 6 months, 20 cubic centimeters of her urine evoke no more than the ordinary pregnancy reaction in the isolated rabbit."

It is to be noted that although these authors employ the phrase "Aschheim-Zondek test" in the title and body of their paper, the references to "as little as 1 cubic centimeter of her urine" and to the "stimulated rabbit ovaries," make it obvious that the Friedman test was the one employed. In the Aschheim-Zondek reaction, of course, the test animal is a rat, and 1 cubic centimeter of urine is not a small dose. In the published discussion of the paper there is no comment upon the discrepancy. Dr. Franklin L. Payne (9) mentions a case in which chorio-epithelioma was suspected because 3 cubic centimeters of the patient's urine evoked a positive reaction. A diagnosis of twins, however, was subsequently made. Dr. John C. Hirst (9), in a case in which mole was suspected, obtained a strongly positive Friedman reaction after the injection of "only 2 cubic centimeters of urine (i.e. only one-fifth the usual amount)." His case also later proved to be a twin pregnancy.

This discussion and the figures are mentioned not with any intention of criticizing the admirable work of Dr. Mazer, which we have followed with interest and profit, but merely to show that there is some confusion in the recent literature as to the normal amount of prolan in pregnancy urine and as to what should constitute a positive Friedman test for hydatid mole or chorio-epithelioma. The phrases, Aschheim-Zondek and Friedman tests, are interchanged a little indiscrimi-

nately. In the two tests not only are the experimental animals different, but in the Aschheim-Zondek test one measures a substance which causes immature rat ovaries to mature. In the Friedman test, one measures usually a substance which causes a mature ovary to form follicles.

It is not conclusively demonstrated that the two causative agents are the same, or that the Friedman will be as much intensified in an abnormal pregnancy as the Aschheim-Zondek. Successful diagnosis of hydatid mole and chorio-epithelioma by the Aschheim-Zondek technique has been many times reported. It is our purpose to discuss the diagnosis of mole by the Friedman technique and to report a case.

In the Friedman test as it is usually performed (1, 3, 5, 6, 7, 10, 12, 13), from 10 to 30 cubic centimeters of a morning specimen of urine, in divided doses, is injected into a mature female rabbit. The only instance that we have of the routine use of a smaller quantity in a large series of cases is that of Wilson and Corner, who reported 98 per cent correct laboratory diagnoses in 196 cases, following the injection of only 5 cubic centimeters of a morning specimen of urine. Their method differs from the usual Friedman technique also, in that they injected a single dose of urine in the late afternoon, and examined the rabbit the following morning. Friedman (4) has recently described a modification of his technique to give quantitative results.

In the quantitative technique he uses 24 hour specimens of urine and a postpartum rabbit whose litter has been taken away from her; under which circumstances, he says, the rabbit is always in heat. Murphy has studied a number of hospitalized patients between the second and eighth month of pregnancy by this method. To compare his figures with those usually obtained clinically, we have calculated the smallest amount of urine with which he obtained a positive test, assuming that his rabbits weighed 2 kilograms. This is for comparison with other clinical results, and for enlightenment as to what should constitute a "minimal effective dose" in mole or chorio-epithelioma.

TABLE I.—MINIMAL EFFECTIVE DOSE OF PREGNANCY URINE EVOKING POSITIVE REACTION IN 2 KILOGRAM RABBIT

(Calculated from Murphy)

Clinical case	Rabbit units in 1 c.cm.	M.E.D. for a 2 kilogram rabbit
1	0.2	10
2	0.11	20
3	0.33	6
4	0.26	8
5	0.27	8

The figures are of value in indicating that prolan does not increase in all normal pregnancies to the extent that is reported. In none of these cases could 1 cubic centimeter of urine have evoked a positive test, though they lay between the second and eighth month of gestation. According to Friedman, a positive rabbit test has been obtained with as little as one-sixteenth cubic centimeter of the urine of a normally pregnant woman, though we would suspect that this was an unusual case. Obviously, there is a wide variation in the high and low limits of prolan excretion in pregnancy. The smallest amount of pregnancy urine which can evoke a positive rabbit test, from the rather meager reports available, extends from 20 to 0.06 cubic centimeter.

In attempting to diagnose mole or chorio-epithelioma, these extreme possibilities must be kept in mind. Our case of mole, in which roughly quantitative studies of the rabbit test were made, follows.

CASE REPORT

Mrs. F. C., No. 82857, was admitted to the obstetrical service of the Hillman Hospital under Dr. J. M. Seibold, June 13, 1933. She complained of vomiting, uterine bleeding, and enlargement of the abdomen. She was 47 years old. Her oldest child was 27 years; her youngest 7. She had had a miscarriage nine years previously. She had always suffered from dysmenorrhœa. Beginning in May, more than a year before, she had had menorrhagia, hot flashes, and an enlarged abdomen. Her periods at that time lasted 10 to 14 days. For 5 months before her present illness, however, they were regular and normal, at intervals of 27 to 30 days, and lasted 3 to 5 days. She had a light attack of influenza before her May menstrual period was due. May 16, she began vomiting incessantly, and flowed every day. Her nervousness and hot flashes returned. She was in bed 3 weeks, had nocturia, and for the preceding 2 days vomited blood.

TABLE II.—FRIEDMAN TESTS IN A CASE OF HYDATID MOLE

Type rabbit	Weight, kilograms	Date injected	Amount	Date injected	Amount	Date examination	Results
New Zealand, white	3.18	6–19–33	12 c.cm.	6–21	10 c.cm.	6–22	Positive
Chinchilla, grey	2.04	6–23	1 c.cm.	6–24	1 c.cm.	6–25	Positive
Chinchilla, grey	3.63	6–23	0.25	6–24	0.25	6–25	Positive
Chinchilla, grey	2.27	6–23	0.031	6–24	0.031	6–25	Positive
Chinchilla, white	5.83	6–29	0.02	6–30	0.02	7–1	Negative though ovaries stimulated
Chinchilla, white	3.63	6–29	0.01	6–31	0.01	7–1	Negative though ovaries stimulated

Physical examination showed many missing and carious teeth, marked endocervicitis, and a uterus enlarged to the size of a 6 months' pregnancy. Physical findings otherwise were negative. There was an anæmia, with hæmoglobin 57 per cent, red cells, 3,350,000, and color index 0.9. Urinalysis, and the blood Wassermann and Kahn tests were negative.

X-ray examinations in June and later in July (Dr. Barfield-Carter and Dr. J. A. Meadows) showed a soft tissue tumor in the pelvis but no outline of a fetus. The general condition of the patient improved with hospitalization. No fetal heart sounds were heard; there were no fetal movements; and no fetal parts could be distinguished. The patient was transferred to the Gynecologic Service shortly after her admission.

Menopause, complicated by a large bleeding fibroid, was considered as a possible diagnosis. Dead fetus was considered, and hydatid mole or chorio-epithelioma was suspected.

Friedman tests with decreasing quantities of a morning specimen of urine were made, with the following results. Mature rabbits were used but not postpartum animals. All were subjected to laparotomy for examination of the ovaries immediately before the first injections.

The Friedman test, as shown in Table II, was strongly positive after injections into rabbits of respectively 22, 2, 0.5 and 0.06 cubic centimeters of a morning specimen of urine. Smaller quantities, 0.04 and 0.02 cubic centimeter, respectively, produced a marked ovarian reaction, but not what we consider a positive pregnancy test.

On July 27, the patient complained of pains in the back, later of pains like labor pains, she began bleeding freely, and passed a mass resembling gelatin beads. She gave the appearance of impending shock. She was taken to the operating table, where her cervix was seen to be soft, dilated, bluish, oozing blood, which contained clots with the described gelatin-bead bodies in them. The uterus was emptied with sponge forceps and a curette. The specimen removed weighed 912 grams, and was diagnosed in the laboratory by Dr. George S. Graham as hydatidiform mole.

Four days later her condition had much improved. She received a transfusion of 520 cubic centimeters of whole blood. Later she was given three treatments of massive X-radiation and 1400 milligram-hours of radium (Dr. J. A. Meadows). She was discharged August 10, to remain in her home for 2 weeks and then return for a panhysterectomy, but overstayed her time.

Her condition on readmission, August 29, was good. The cervix was infected from slight radium burns and was cauterized thoroughly before operation, September 2, when panhysterectomy and appendectomy were performed.

The pathological report (Dr. Graham) showed a persistent focus of trophoblastic infiltration of the myometrium.

Her recovery was uneventful except for a diarrhœa, which was probably from intestinal irradiation, and a sinusitis which developed during convalescence.

She was discharged October 8, in good condition, except for a residual marked anæmia (hæmoglobin 44 per cent). A Friedman test 3 months later, in which a total of 30 cubic centimeters of urine were injected, gave a negative reaction.

It is of some interest that although 24 hour specimens of urine were not employed, the Friedman tests of this patient, came within the limit mentioned by Mazer for a positive diagnosis of mole, since a positive reaction followed the injection of 0.06 cubic centimeter of urine.

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A LOWERED MORTALITY IN ACUTE APPENDICITIS AND THE BASIS THEREFOR[1]

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REPORTS in the literature indicate that the mortality rate of acute appendicitis in its severer forms is not diminishing despite the accumulated experiences of several decades in the surgical treatment of the disease. In keeping with the results reported by others an analysis of the three year period 1928, 1929, 1930, on the surgical service of Mount Sinai Hospital to which we were attached discloses the data shown in Table I.

TABLE I.—DATA FOR 1928, 1929, 1930

Type	Cases	Deaths	Mortality per cent
Acute phlegmonous or gangrenous...	103	1	0.97
Acute, with abscess.....	33	7	21.2
Acute, with local peritonitis.....	9	2	22.2
Acute, with diffuse peritonitis.....	14	3	21.4
Total.....	159	13	8.2

In 1930 the problem of appendicitis was taken up anew from several angles: individualization of cases, indications for operation, operative technique, and general management. It was thought that careful consideration of these aspects might lead to some reduction of an obviously high mortality. The results for the second 3 year period are:

TABLE II.—DATA FOR 1931, 1932, 1933

Type	Cases	Deaths	Mortality per cent
Acute phlegmonous or gangrenous...	112	0	0
Acute, with abscess.....	31	2	6.4
Acute, with local peritonitis.....	12	0	0
Acute, with diffuse peritonitis.....	18	3	16.6
Total.....	173	5	2.8

Some comments on classification and mortality should be made before the methods to which we ascribe the improvement in results are outlined. All cases in which operation was done in the 6 year period are included. The milder forms of acute appendicitis were eliminated because their inclusion tends to distort the true picture. Thus, the addition of more than a hundred such cases without mortality would so lower the total figures for acute appendicitis that the results in the significant groups of cases might be glossed over. The classification of acute phlegmonous (all layers involved) and acute gangrenous appendicitis (Group 1) is based on the operative findings and the pathological report. Some exudate was often present on the surface of the appendix in such cases. Clear or straw-colored peritoneal fluid was not infrequently noted but was not classified as a local peritonitis. By the latter (Group 3) is meant considerable periappendiceal exudate or free purulent fluid in the appendiceal region and (or) pelvis. The abscess group (Group 2) comprise an abscess or abscesses completely walled off from the peritoneal cavity by intestine and (or) omentum.

In the first 3 year period, autopsies were performed in 8 of the 10 fatal cases in the first three groups. Suppuration was the cause of death in all. The clinical course indicated that infection was also the cause of death in the 3 cases with diffuse peritonitis. It has been shown elsewhere that suppuration is the most common cause of death after laparotomy for any infective intraperitoneal lesion.[2] Widespread local suppuration or diffuse peritonitis in the appendicitis abscess and local peritonitis groups were the essential lesions at autopsy. *A priori* it can be said that death from a spread of infection should not occur after operation for appendicitis abscess. There must be something fundamentally wrong in the high mortality of operation for appendicitis abscess, insofar as the mortality is due to a peritonitis which did not exist at operation. To argue that such gross extension of infection might have occurred without operation is begging the question. The only logical conclusion is that it was induced by operation.

The two deaths in the abscess cases in the second 3 year series can be briefly discussed. In one, a putrid lung abscess, presumably due to aspiration, developed, and the fulminating pulmonary lesion seemed to be the obvious

[2]Neuhof, Harold, and Aufses, Arthur H. The causes of death after operation. Ann. Surg. 1930, xci, 321.

[1] From the Surgical Service of Dr. Harold Neuhof, Mount Sinai Hospital, New York.

cause of death. There was no autopsy. The second patient died 8 weeks after operation for appendicitis abscess. There had been considerable infection of the abdominal wall. A prolonged exhaustion psychosis appeared to be the cause of death. At autopsy there was no evidence of peritoneal infection.

Two deaths are not included in the tables of the second series. One patient was a child with diffuse peritonitis of a week's duration who was not operated upon and died a few hours after admission. The other patient was transferred to the surgical service with pylephlebitis and multiple abscesses of the liver as found at operation performed on admission. The removal of the causative appendiceal lesion did not influence the clinical course. Autopsy confirmed this statement.

DIAGNOSTIC FEATURES

A carefully obtained history has proved to us to be the most important factor in the diagnosis of acute appendicitis. The well known sequence of events is rarely lacking. If pain is localized, its site is a suggestive lead to the situation of the lesion. Special palpation for a mass is an essential step because operation may be deferred under circumstances to be noted when a mass is felt. We have repeatedly observed that masses are much more readily discernible by gentle than by firm palpation. The "rebound sign" is not used, for we believe that it is unnecessary, may prove misleading, can excite undue pain and apprehension, and may invite the spread of infection. Left sided abdominal puncture is performed when the diagnosis is in doubt and the patient is seriously ill. The procedure is of decisive aid in establishing the presence or absence of a peritonitis as well as the degree of the peritoneal infection. It is often practiced when the diagnosis of appendicitis appears certain in order to determine if diffuse peritoneal invasion is present or absent. The technique of, and experiences with, abdominal puncture have been reported elsewhere.[1] The subject is mentioned here because of its bearing on precision in diagnosis and therefore on plan for treatment. Whether or not a mass is felt, an effort is made to determine the situation of the appendiceal lesion. As stated, we accept localized pain as one lead. The site of localized tenderness, if present, is painstakingly sought for. A co-operative patient is asked to palpate his or her own abdomen to aid in determining the region of maximal tenderness. The abdomen is again palpated gently when the patient is anæsthetized in order to determine if a mass can be felt. We stress the efforts at localization because the assumed site of the infected appendix is our guide for placing the abdominal incision.

[1] Neuhof, Harold, and Cohen, Ira. Abdominal puncture in the diagnosis of acute intraperitoneal disease. Ann. Surg., 1926, lxxxiii, 454.

PRE-OPERATIVE TREATMENT—THE CHOICE OF TIME FOR OPERATION

The correct choice of time for operation can be an important factor in the outcome of the case. We do not refer to patients in good condition with the symptoms and signs of an uncomplicated acute appendicitis. All patients with a short history (within 24 hours) are operated upon promptly. In many cases of 36 to 48 hours' duration patients are also subjected to operation shortly after hospitalization. However, in the second day phase and thereafter, operation is not infrequently deferred for a time if the patient is not in good condition. The trip to the hospital may have been long and difficult, a patient may arrive in a highly excited state, another patient may be partially dehydrated. Examination may lead to the diagnosis of a localizing or localized infection. These are some of the factors which often lead us to wait a few hours or longer before proceeding with operation in the second or third day of an attack of acute appendicitis. The temperature and pulse rate usually drop with rest in bed. Dehydrated and shocked patients are placed on a slow intravenous drip of 5 per cent glucose in normal saline solution.

Young children and infants comprise a separate class because of the difficulties in determining the extent of the lesion and an apparently smaller likelihood of walling off of the infection. They are therefore operated upon without delay at any period, intravenous glucose solution being the only preoperative therapy when the general condition is not satisfactory.

We rarely operate on appendicitis abscess as an urgent case. In fact, immediate operation is contra-indicated by us in most cases with well localized masses. These patients usually enter the hospital with considerable fever and rapid pulse. With rest in bed, light fluid diet, and intravenous glucose solution, if necessary, the fever subsides, the pulse rate slows down, and the general condition improves. This has been our invariable experience in the past 3 years. Coincidentally spasticity becomes less evident, the mass less tender, and more clearly defined. Operation is often deferred for several days and is usually performed when the temperature and pulse rate are approximately normal and the mass well circumscribed. We believe that the mortality of appendicitis abscess in the first series, as high as the mortality of appendicitis with peritonitis, is ascribable in part to the fact that operations were emergency procedures.

Critically ill patients with diffuse peritonitis are not operated upon directly after hospital admission. They are given absolute rest in bed, morphine, and intravenous glucose in normal saline solution, and are under continuous observation. Operation is usually performed several hours after admission, at which time some, and occasionally great, improvement in the general condition is to be noted.

In all cases placed on pre-operative intravenous therapy, the slow drip is continued throughout operation and is maintained for hours to days after operation depending on the condition of the patient.

ANÆSTHESIA

Avertin is administered to the great majority of cases, children included, usually with the addition of nitrous oxide-oxygen, and, occasionally, ether. Postoperative nausea and vomiting are greatly reduced thereby, and abdominal distention is less apt to occur than with nitrous-oxide ether anæsthesia. Spinal anæsthesia is reserved for obese patients who are not gravely ill. We believe that the shock which results occasionally from spinal anæsthesia lowers general resistance to infection and in that sense invites spread of infection.

OPERATION

We are fundamentally opposed to the concept of a procedure to be done with great celerity through a small incision, or with tactile location and finger delivery of the appendix. Many patients will of course recover after a technique quite out of line with the niceties of operative procedures customarily practiced in abdominal surgery. We are convinced, however, that spread of infection is a not infrequent sequel which can be avoided with a careful and deliberate technique. Conceding the occasional necessity for speed of operation, we are of the opinion that the great majority of patients will have a better chance for survival with a carefully executed operation performed under adequate visualization. As already shown, the most common cause of death after operation is intraperitoneal suppuration and not a complication at some distant place.

INCISION

The incision should be large enough for full visualization of the lesion. The type and placement of the incision depend on the location or assumed location of the appendiceal lesion. The majority of our patients have been operated upon through a rectus splitting incision. If a McBurney incision is employed we sever the muscles when better exposure is required. A vertical incision through all layers lateral to the rectus is practiced for a laterally situated appendix. Whenever a mass is felt, the incision is placed directly over it. A routine incision which disregards the situation of the lesion is illogical. It may open the peritoneal space for more than the required extent, may make access to the appendix more difficult, and for these reasons may lead to spread of infection. The incision should always be enlarged in the desired direction for adequate exposure, rather than to apply vigorous retraction for the purpose.

INTRAPERITONEAL PROCEDURES

Suction is at hand and is employed for the removal of infected fluid in the operative field. As soon as the cæcum is identified and isolated, the peritoneal cavity is shut off with moist pads or packings. Whenever feasible

the omentum is drawn down and spread over loops of gut before the pads are placed in position. Other than the terminal ileum, no small intestine is to be seen in the field until the time for closure of the abdominal incision. The base of the appendix is identified by following the anterior longitudinal band of the cæcum. A ligature is passed through the meso-appendix at this point, the cæcum is packed away, and gentle traction is made on the ligature. The appendix is then delivered from base to tip by placing Allis' forceps about it, under inspection. If the appendix is adherent it should be freed by instrumental dissection. Handling of the infected organ is not necessary in the majority of cases. If palpation is required to determine the position of the appendix or if manual delivery of the appendix must be performed, the contaminated glove is at once discarded. There should be no contact between the appendix and adjacent pads or retractors during its delivery under full vision. The cæcum is not packed away but is held out of the wound to facilitate the delivery of a deeply placed appendix. When a mass is present, an abscess is assumed to exist. The instrument for its entry (bone elevator or curved scissors) is held in one hand and the suction tip in the other so that pus is sucked up as soon as pus is encountered. The correct plane of cleavage in abscess cases is carefully sought for and maintained under inspection. A sterile light is useful for this purpose and can at the same time be employed as a retractor. Abscess cavity or cavities are explored to their limits in order to be sure that unopened pockets are not left behind. The appendix is usually but not invariably removed.

DRAINAGE

Strips of iodoform gauze of varying width, depending on the individual requirements, are used. In abscess cases they are packed into all recesses of the cavity or cavities. Packing by gauze is employed in non-abscess cases if appreciable purulent exudate about the appendix exists or when the appendix has been attached to an obviously infected bed. In our opinion, drainage is particularly indicated in such cases when the infected area is behind the cæcum against the posterior parietal peritoneum.

Drainage by tubes is not employed. We consider tube drainage not only illogical but also an invitation to maintenance and spread of infection for the following reasons: (1) no assurance that the tube remains where it is placed; (2) irregular collapse of walls of abscess cavity or infected bed around and beyond the tube with consequent tendency towards pocketing; (3) the postmortem evidence of residual abscesses about tube drains; (4) the commonly noted postoperative foul discharge and sloughing with tube drainage. We regard perfunctory gauze drainage as unsatisfactory as drainage by tubes. Gauze drainage is only correct if the infected area or areas are packed open widely from the bottom.

Contaminated instruments, and gloves if contaminated, are discarded after the gauze pack is placed. Rubber dam is used to separate the gauze from intestines, and omentum is drawn alongside whenever feasible. The abdominal wall is closed in layers but not tightly about the drains.

POSTOPERATIVE TREATMENT

Drains are not disturbed until loosened by discharge. Their gradual shortening is usually begun about a week after operation. Discharge is rarely profuse and never foul. Infection of the abdominal wall is also rare. When the packing is removed, a clean bed is usually seen; light repacking is not infrequently desirable in order to prevent premature closure.

As already stated, the intravenous drip started before or during operation in the more serious cases, is maintained after operation until the general condition is satisfactory. We believe that a number of our cases have recovered as the result of the continuous intravenous administration of glucose saline solution. When kept up for days the needle is shifted from vein to vein in order to minimize the chances of phlebitis. Commonly employed procedures such as the indwelling Levin tube and colonic irrigations require no discussion. In our opinion rest is imperative for sick patients and we do not hesitate to administer adequate amounts of opiates for that purpose. Cathartics are never admin-

istered until the patient is convalescent and are rarely given at any time. Manifestations of intestinal obstruction are assumed to be due to angulation of bowel by fibrinous exudate which is likely to absorb. The occasional cases in which intestinal obstruction has developed in the early postoperative period have therefore not been subjected to operation and all have spontaneously recovered.

Regardless of physical signs suggesting a pulmonary or some other distant postoperative complication, we assume that a patient who is not doing well after operation is suffering from infection related to the operative field. Close watching for evidence of suppuration is therefore begun under such circumstances. The status of the general peritoneal cavity can be almost certainly established by left-sided abdominal puncture if there is the slightest doubt as to the existence of peritonitis. The timely drainage of a subphrenic abscess, an encapsulated intraperitoneal collection of pus or a retroperitoneal phlegmon may prove to be the vital factor in the recovery of the patient.

SUMMARY

Intraperitoneal suppuration and not some distant complication is the usual cause of death after operation for acute appendicitis.

Death should occur only rarely after operation for acute phlegmonous appendicitis, appendicitis with local peritonitis, or appendicitis with abscess, unless diffuse peritonitis also exists at the time of operation.

A comparison of the mortality of the severer forms of acute appendicitis on one surgical service in two successive 3 year periods shows a marked reduction in the second period except in the category of diffuse peritonitis.

The factors contributing in varying degree to the lowered mortality are discussed under several headings: diagnostic features, preoperative treatment, the choice of time for operation with special reference to appendicitis abscess, anæsthesia, general principles of operation, choice of incision, carefully executed operation under full visualization with minimal soiling, gauze drainage, postoperative management, the search for, and timely drainage of, complicating suppurative foci.

CLINICAL SURGERY

FROM THE DEPARTMENT OF SURGERY, UNIVERSITY OF NEBRASKA

ABDOMINAL INCISION IN LESIONS OF THE RECTUM AND RECTOSIGMOID AS RELATED TO THE COLOSTOMY

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THE statement by Moynihan that circumstances connected with the incision are now among the most important in the whole range of abdominal surgery I believe was no exaggeration. In the election of an initial abdominal incision in cases of carcinoma involving the rectum and rectosigmoid, a more complicated set of purposes arises than in questions dealing with the average cœliotomy. In most instances and at the hands of the majority of operators, a two-stage procedure is preferable in carcinoma of this area, and not infrequently an abdominal incision is made in both stages. There are two essentials demanded—first, a correctly placed incision, ample enough to carry out thorough exploration, both palpatory and visual, and to permit any necessary intra-abdominal procedure; second, the carrying out of a properly placed colostomy, either loop or end type, and either temporary or permanent. It seems to be the consensus of opinion that a median or paramedian incision offers the operator the better opportunities. I prefer the paramedian incision because I believe it is fairly well established that muscle-to-muscle and fascia-to-fascia approximation gives better support to the wound, and where a colostomy is implicated, complete surrounding of the limb or limbs of colon by muscle tissue provides a better functioning colonic aperture. As a matter of fact, probably all abdominal work could be done with two incisions, namely, the right and left paramedian incisions.

As to the considerations against the lower left paramedian incision, it is commonly believed that herniation is more liable to follow a rectus incision than a left McBurney or muscle splitting incision; that the re-opening of a potentially infected wound at the second stage of an operation may introduce infection into the peritoneal cavity; and if the wound does heal there is the possibility of a weak abdominal wall. As to the first considered adversity, I have found that herniation very rarely occurs at the site of a left rectus incision if the abdominal wall is correctly and securely closed. The following technique has been used in my cases. When surgery of the large bowel is involved, with or without colostomy, the peritoneum is closed by a continuous chromic catgut suture. If a limb of bowel is brought out through the wound, separate sutures are entered above and below the protruding viscus. These should be brought fairly snug around the ends of the loop of bowel. The first tier of sutures, continuous in type, securely closes the peritoneal cavity and holds the peritoneum and overlying transversalis fascia in approximation. The second tier, bringing together muscle and fascia, is of interrupted chromic catgut sutures, placed about 1 centimeter apart. There is greater strain upon the more superficial muscle and fascia layers and if a continuous suture is used, the entire length of the wound is threatened should the suture break. With interrupted sutures in these layers, this hazard is not so great, even in the face of infection. The skin is closed with interrupted dermal sutures, with or without the additional support of silkworm figure-of-eight retention sutures. I am beginning to doubt the necessity of these latter sutures if the wound is closed as heretofore described and have omitted them on many occasions. This type of wound closure is used at both stages of the operation. Following this technique in a series of seventy-five colostomy cases, I have had no instance of true herniation develop and only on one occasion have I detected even a slight weakness in the abdominal wall.

In opening the left rectus incision at the second stage of the operation, I have found that gross infection of the wound is quite rare if proper pre-operative management and colon surgery technique have been followed. These wounds seem to heal in spite of their constant

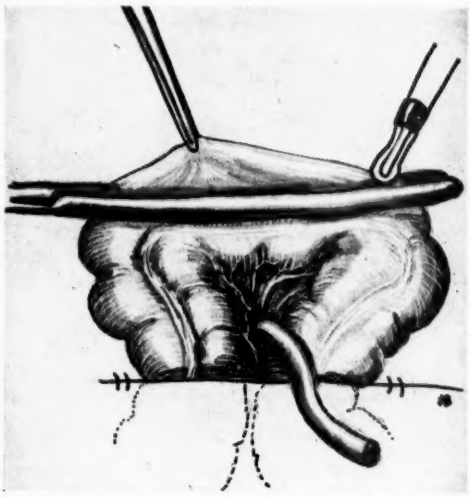

Fig. 1. Temporary colostomy through left rectus. Application of crushing clamps in longitudinal direction and excision of the tissue with cautery. Bowel drainage permitted by release of clamps, thus requiring no further use of cautery.

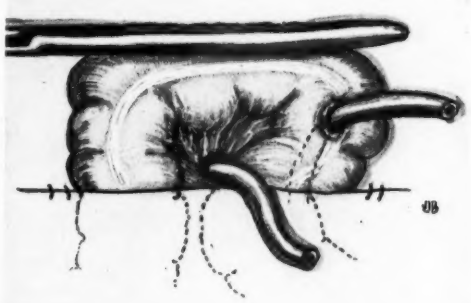

Fig. 2. The tissue beyond the clamp has been excised with the cautery and release of the clamps establishes the temporary colostomy through the left rectus. If immediate drainage of the proximal loop is imperative, a small catheter is pursestringed into this loop.

contact with fæces, particularly if the fæces are not permitted to neighborhood the wound during the first 12 to 24 hours. If infection does occur, the time elapsing between the first and second stages of the operation usually permits proper recovery of the tissues and establishes an immunity. An abdominal wall is probably stronger after two incisions through the same area with proper suturing, than after two incisions in close proximity, either properly or improperly sutured.

The following types of incisions are usually elected by the various surgeons. Lahey and his colleagues use the median incision between the pubis and umbilicus, and bring out the proximal end of the sigmoid through a very small left McBurney incision. The distal end is implanted in the lower angle of the median incision. This permits thorough through-and-through irrigation of the diseased segment, a point which I think is a marked advance in technique and which I personally follow. At the second stage of the procedure, the median incision is re-opened. Just what procedure this author follows in the inoperable case is not stated in this noteworthy contribution. Rankin prefers a low median incision and inguinal colostomy, although the distal segment is dropped back into the abdomen. He re-opens this incision at the second stage. The technique of the inoperable case is not described. Coffey uses a right rectus incision and pulls the proximal end out through a left rectus incision. By his technique, the second stage is entirely a perineal operation. C. H. Mayo describes a left muscle splitting incision parallel with Poupart's ligament, ample enough for palpatory exploration. The layers of the abdominal wall are brought out under the loop. At the second stage, a midline incision is probably used, although this is not definitely stated. I doubt if this primary incision gives one quite the freedom for exploration and vision into the abdomen that the midline or paramedian incision does. Also in this technique, the cautery is used later to open the colostomy rather than merely releasing the clamps. However, both colostomy limbs are completely surrounded by muscle which I believe is essential in a properly functioning colostomy. Regarding the advantages of the left rectus incision, there is greater ease of exploration, both palpatory and visual. The left lumbar gutter may be closed off by a pursestring suture without difficulty. A good functioning colostomy, either between the fibers of the left rectus or through an accessory small McBurney's incision, may be made and in either instance will be completely encircled with intact muscle fibers, which is so important in the permanent colostomy, whether in an operable or inoperable case. Any type of lesion, under any or all circumstances, may be adequately dealt with.

Now let us consider the various possibilities of a clinical nature which may present themselves. In acute obstruction of the colon within the sigmoid or rectum, the left rectus incision affords an ample opening and, if exploratory is not contra-indicated, it may be carried out with ease. If a temporary type of colostomy is indicated, a

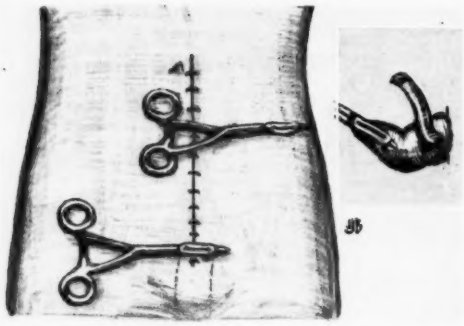

Fig. 3. If case is operable, the method of Lahey is followed. The proximal segment is brought out through the small left McBurney incision and clamp left on. The distal loop is clamped at the lower margin of the left rectus incision. If immediate drainage is necessary, a small catheter is pursestringed into the proximal stump as shown in the insert.

loop of sigmoid may be brought out over a glass rod through this incision after the left lumbar gutter is closed off. To avoid subjecting the patient a few days later to the repugnance of the odor of his own burning flesh, and perhaps the application of clamps to bleeding points with its attending distress, I usually follow a suggestion of Hirschman, except that I go a step farther. Hirschman suggests in his paper, "Median Colostomy (Umbilical)," grasping a longitudinal

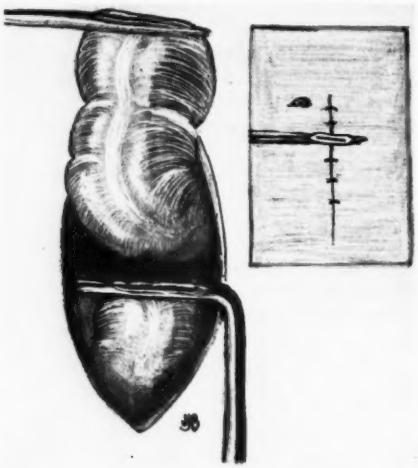

Fig. 5. If an anterior resection is advisable, the distal stump is securely closed and the proximal limb is brought out through the upper angle of the left rectus incision and colostomy established. A catheter may be pursestringed into the side of this stump if necessary.

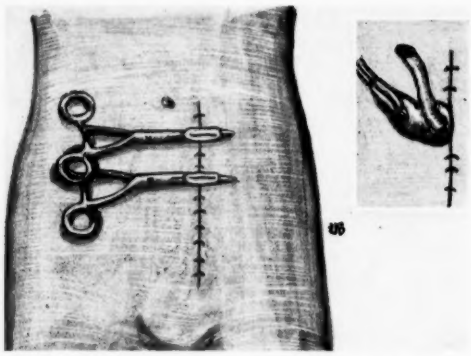

Fig. 4. If the case is inoperable, the loop of sigmoid is brought out through the left rectus incision, a bridge of all layers of abdominal wall is brought through a rent in the mesocolon and sutured. The remainder of the wound is then closed and the sigmoid severed between two clamps, thus establishing a good end type of permanent colostomy. This method is also used in operable cases of colostomy and posterior resection. If immediate drainage is necessary a small catheter is pursestringed into the proximal stump as shown in the insert.

band by two forceps about 2 to 3 inches apart, raising upward, and then applying a long curved clamp just below the ends of the traction forceps. The clamping of the forceps puts pressure on a spindle shaped area which becomes the opening of the colostomy when the clamp is later removed. Of late, in a number of cases, I have applied the clamp and then with cautery destroyed the bowel tissue beyond the margin of the clamp. If it is then necessary to open the clamp in a few hours, the opening is already present; or if immediate drainage of the bowel is necessary, a catheter may be pursestringed into the loop of sigmoid and immediate drainage established, followed later by the removal of the clamp for the regular colostomy opening. Following this technique, whether the case is operable or inoperable, and whether permanent or temporary colostomy is necessary, there is no necessity for the patient to experience the inimical odor of his own burning flesh and the distress and discomfort that usually accompany the grasping of bleeding points along the mesenteric border.

If the case is considered operable and one follows the technique of Lahey for abdominoperineal resection, this incision is also most serviceable. If immediate drainage of the bowel is necessary, a catheter may be inserted just proximal to the clamp and held in place with a pursestring suture (Fig. 3).

If the case is operable and colostomy and posterior resection is the operation of choice, the

following technique is used. After ligation of a few blood vessels in the mesentery of the sigmoid to permit a rent of sufficient size, the left lumbar gutter is closed. Holding the loop of sigmoid upward, a tongue of peritoneum is brought beneath the loop and secured to the opposite peritoneal wall. Likewise a layer of muscle and fascia is brought beneath the loop and secured by a mattress chromic catgut suture. Finally, the skin is brought beneath the loop and secured with a mattress suture of dermo. The peritoneal edges at the upper angle of the wound are brought together with a continuous chromic catgut suture, as are those at the lower angle of the wound. The muscle and fascia are approximated with interrupted chromic catgut sutures placed about 1 centimeter apart. The closure around the limbs of bowel should be rather snug to permit early sealing off of the peritoneal cavity. The skin is closed with interrupted dermo sutures. Two crushing clamps are applied close together and the bowel severed with the cautery (Fig. 4). The clamps are left on and strapped to the abdominal wall. The clamps are released 48 to 72 hours later. If immediate drainage of the bowel is necessary, a small catheter may be inserted into the lumen of the bowel just proximal to the proximal clamp, using a pursestring suture to prevent contamination.

In cases in which the lesion is so advanced as to be inoperable, the technique for colostomy is the same as that just described for colostomy and posterior resection. This gives a good functioning end type of colostomy in this group of individuals in whom the minutest details for comfort are most necessary and deserved. Bowel contents do not pass over from the upper stoma into the lower diseased segment and cleansing irrigation of the lower segment is easily carried out.

If anterior resection of the sigmoid is feasible, this incision permits adequate exposure and the intermuscular end type of colostomy may be established at the upper angle of the wound (Fig. 5).

With this time honored incision, both emergency and selective operations are adequately handled and desirable types of colostomies may be placed in both operable and inoperable cases. If a permanent colostomy is necessary in either case, the end type of colostomy well encircled with muscle is easily carried out. In no instance is it necessary to use the cautery after the patient has left the operating room. In the inoperable case greater comfort is given the patient by permitting through-and-through irrigation of the diseased distal segment. In the inoperable case in which colostomy carries a material increase in mortality, one is able to give the patient an end type of colostomy completely surrounded by muscle and there is no fear of spreading infection into the peritoneal cavity since the bowel continuity is not severed until the abdomen has been completely closed. Drainage of the proximal limb may be instituted immediately with very little danger of contamination.

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PEPTIC ULCER OF MECKEL'S DIVERTICULUM

A Report of Two Cases and a Review of the Literature[1]

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MECKEL'S diverticulum, which represents a remnant of the intestinal end of the omphalomesenteric duct, occurs in 1 to 2 per cent of the human race and is more common in the male sex. The mucous membrane of the diverticulum, usually of the ileac type, may also be of gastric and less often of duodenal, jejunal, or pancreatic character. When present, the gastric mucosa generally lines the greater portion of the diverticulum and may include both fundus and pyloric glands. Schaetz, in a study of 37 specimens of Meckel's diverticulum, found gastric mucosa present in 16.6 per cent, duodenal or jejunal mucosa in 10 per cent, pancreatic tissue in 2.7 per cent, and both pancreatic and gastric tissue in 5.4 per cent. Koch states that gastric mucosa was present in 12 per cent of the specimens which he examined. Hudson and Koplik report the presence of gastric mucosa in 52 per cent of 23 specimens studied microscopically. In a subsequent article by Hudson, in which 13 cases of Meckel's diverticulum are reported, gastric mucosa was present in 7 cases and duodenal mucosa in 1 case. In our review of the literature we have found 46 cases of typical peptic ulcer substantiated by histological examination, which with the addition of our 2 cases, makes a total of 48 cases (Table I). In this group 44 specimens contained gastric mucosa, 2 specimens both gastric mucosa and pancreatic tissue, 1 specimen pancreatic tissue, and 1 specimen duodenal mucosa. It is interesting to know that in umbilical cysts or fistulas, which represent remnants of the umbilical end of the omphalomesenteric duct, gastric mucosa may also be found. Achsner and Karelitz have collected 9 reports from the years 1881 to 1908 of tumors, cysts, or fistulas of the umbilicus secreting an acid fluid, which structures when removed and examined presented in whole or in part the histology of gastric mucosa. Lindau and Wulff have reported a case of an umbilical pouch lined by gastric mucosa containing a chronic peptic ulcer.

The clinical picture of peptic ulceration of Meckel's diverticulum is comparatively new. Deetz, in 1907, reported a case of acute perforation at the base of a Meckel's diverticulum in a boy 9 years of age. The diverticulum was amputated distal to the site of perforation, and microscopically it showed gastric and pancreatic tissue. He suggested that the process which resulted in perforation might be similar to that occurring in gastric ulcer. Huebschmann, in 1913, reported the case of a boy 4½ years old who had intestinal hæmorrhages after abdominal trauma. One month later he developed peritonitis and died after operation. At autopsy a perforated marginal ulcer was found at the edge of gastric mucosa. Because of the absence of inflammatory signs he did not think that the perforation was the result of a diverticulitis. Callender, in 1915, described the autopsy of an infant 19 months of age which had died from intestinal hæmorrhage. A diverticulum 2.5 centimeters long was found with a punched-out regular ulcer eroding an artery at the junction of gastric and ileac mucous membranes. In the same year Gramen reported a case in a 10 year old boy who suddenly developed peritonitis and was found at operation to have a perforated ulcer of Meckel's diverticulum located at the edge of gastric mucosa. In 1924, R. H. Jackson reported a case of a 10 year old boy who was operated upon in 1912 because of repeated intestinal hæmorrhages. An eroded vessel was noticed in a marginal ulcer at the base of Meckel's diverticulum. It was not subjected to histological examination and it was suggested that it might be tuberculous. This case was unquestionably one of peptic ulcer. In 1925, Stulz and Woringer reported 2 cases of their own and 11 cases which they had collected from the literature. They described very accurately the clinical syndrome accompanying this pathological condition. Abt and Strauss, in 1926, reported 3 cases and called attention to the syndrome described by the writers just mentioned. The greater number of cases have been reported since 1920. Since 1930, reviews have been published by Achsner and Karelitz, Lindau and Wulff, and Mason and Graham. In 1932, Vaughn and Singer described comprehensively the perforative type of peptic ulcer.

The two following cases of our own represent two contrasting examples. The first case presents the more typical clinical picture of recurring massive hæmorrhage from the bowel without other specific symptoms or physical signs; while the second case, chronologically our first case, illustrates the more infrequent circumstance of acute

[1]The two cases reported in this article were reported separately by Dr. Renner in a brief paper which he read before the Section of Pediatrics and Obstetrics of the Ohio State Medical Association, at the meeting at Akron, Ohio, September 7, 1933.

TABLE I.—DEFINITE PEPTIC ULCER CASES WHICH HAVE BEEN CONFIRMED MICROSCOPICALLY

Author	Year	Age	Sex	Symptoms			Pre-operative diagnosis	Gross findings	Histological findings	Result	Remarks
				Pain	Intestinal hæmorrhage	Acute abdomen					
1. Deetz (8)	1907	9	M	+		+	Perforated appendix	Perforated ulcer at base. Peritonitis	Gastric and pancreatic mucosa	Recovered	First definite clinical case
2. Huebschmann (22)	1913	4½	M	+	+	+	Peritonitis	Perforated marginal ulcer. Peritonitis	Ulcer at edge of gastric mucosa	Died	
3. Callender (6)	1915	19 mo.			+		Autopsy. Death of hæmorrhage	Punched-out ulcer at base. Eroded vessel	Gastric and ileac mucosa	Died	
4. Gramen (15)	1915	10	M	+		+	Appendicitis	Perforated ulcer. Peritonitis	Ulcer at edge of gastric mucosa	Recovered	
5. Meulengrecht (36)	1918	12	M	+	+		Autopsy. Death of other cause	Ulcer about to perforate	Ulcer at edge of gastric mucosa	Died	
6. Mueller (38)	1919	11	M	+	+	+	Peritonitis	Perforated ulcer	Ulcer at edge of gastric mucosa	Recovered	
7. Megevaud and Dunant (34)	1922	28	M	+	+		Duodenal or intestinal ulcer	Ulcer at base	Ulcer at junction of gastric and ileac mucosa	Recovered	
8. Schreuder (46)	1923	8	M	+	+		Duodenal ulcer (X-ray)	Thickened pylorus. Ulcer at base of diverticulum. Eroded vessel	Pancreatic tissue at tip	Recovered	Blood in small intestine
9. Brasser (3)	1924	15	M	+	+	+	Tumor or polyp. Autopsy	Perforated ulcer at base. Peritonitis	Ulcer at junction of gastric and ileac mucosa	Died	Perforated 8 days after exploration for tumor or polyp
10. Guibal (18)	1924	14	M		+		Intestinal tuberculosis	Chronic penetrating marginal ulcer. Eroded vessel	Ulcer at junction of gastric and ileac mucosa	Recovered	
11. Humbert (25)	1924	11 mo.	M	+	+	+	Peritonitis	Perforated ulcer. Peritonitis	Ulcer at junction of gastric and ileac mucosa	Died	
12. Pascale (41)	1925	41	M	+	+		Ulcus simplex	Ulcer of Meckel's diverticulum	Peptic character confirmed	Recovered	
13. Ulrich (57)	1925	8 mo.	M		+		Peritonitis	Perforated ulcer. Peritonitis. Blood in peritoneal cavity	Bleeding ulcer at base. Gastric mucosa present	Died	Perforated under observation
14. Abt and Strauss (1) (Case 1)	1926	2	F	+	+		?	Ulcerated and inflamed diverticulum	Gastric mucosa at apex. Infiltrated and fibrotic like around peptic ulcer	Recovered	
15. Etchegorry (11)	1926	16	M	+		+	Appendicitis with peritonitis	Perforating ulcer partially walled-off	Gastric mucosa distal to ulcer	Recovered	
16. Kleinschmidt (28)	1927	15	M	+	+	+	Appendicitis	Perforation at base. Peritonitis	Gastric mucosa present	Recovered	Perforated under observation
17. McCalla (39)	1927	4	M	+	+	+	Autopsy	Perforation at base. Abscess in abdominal wall. Peritonitis	Ulcer at junction of gastric and ileac mucosa	Died	Perforated under observation
18. Jackson, A. S. (26)	1927	14	M	+	+	+	Ulcer of Meckel's diverticulum	No gross ulcer	Gastric mucosa and area of ulceration	Recovered	

TABLE I.—DEFINITE PEPTIC ULCER CASES WHICH HAVE BEEN CONFIRMED MICROSCOPICALLY—Continued

Author	Year	Age	Sex	Symptoms			Pre-operative diagnosis	Gross findings	Histological findings	Result	Remarks
				Pain	Intestinal hæmorrhage	Acute abdomen					
19. Taylor (54)	1927	17 mo.	M		+		Autopsy. Death of hæmorrhage	Intra-mesenteric tumor with overlying chronic ileac ulcer	Ulcer bordering a zone of gastric mucosa	Died	
20. Meiss (35)	1928	2	M		+		Intussusception or polyp	Chronic ulcer at tip perforating the ileum at a higher level. Ileum full of blood	Gastric and ileac mucosa	Recovered	
21. Hartglass (20)	1928	14	F	+		+	Perforated appendix	Perforated ulcer at base. Peritonitis	Ulcer at junction of gastric and ileac mucosa	Recovered	
22. Peterman and Seeger (42)	1928	6	M	+	+	+	Ulcer of Meckel's diverticulum	Perforated chronic marginal ulcer, ulcer at tip perforating ileum at higher level, and two ileac ulcers	Gastric mucosa present	Recovered	At first operation 2 weeks previously blood was present in peritoneal cavity
23. Treplin (56)	1929	Child				+	Appendicitis. Appendectomy. Second operation for recurrent pain	Umbilical cyst containing gastric juice. Peptic ulcer at neck of Meckel's diverticulum	Ulcer in ileac mucosa. Islets of gastric mucosa	Recovered	
24. Franke (13)	1929					+	Peritonitis	Acute perforation of ulcer. Peritonitis	Ulcer in ileac mucosa. Cap of diverticulum lined with gastric mucosa	Died	
25. Winkelbauer (59)	1929	2	M	+	+		Intussusception	Indurated, œdematous Meckel's diverticulum	Shallow ulcer near island of gastric mucosa	Recovered	
26. Schmidt (45)	1930	18	M			+	Peritonitis	Two chronic ulcers at neck, one perforated	Ulcers at junction of gastric and ileac mucosa	Recovered	
27. Achsner and Karelitz (2)	1930	15 mo.	F		+		Ulcer of Meckel's diverticulum	Penetrating marginal ulcer. Mesenteric adenitis	Ulcer in ileac mucosa at edge of gastric mucosa	Recovered	
28. Achsner and Karelitz (2)	1930	2	M		+		Intussusception	Peptic ulcer at base	Ulcer at junction of gastric and ileac mucosa	Recovered	
29. Fevre, Patel, and Lipart (12)	1930	7	M	+		+	Perforated appendix	Perforated ulcer at base. Peritonitis	Chronic ulcer. Duodenal mucosa present	Recovered	
30. Fevre, Patel, and Lipart (12)	1930	5 mo.	M	+	+	+	Intussusception	Perforated ulcer at base. Peritonitis	Ulcer at junction of gastric and ileac mucosa	Recovered	
31. Haberer (19)	1930	13	M	+	+	+	Postoperative appendix abscess	Perforated ulcer with local abscess	Ulcer at junction of gastric and ileac mucosa	Recovered	Operated upon 1 month previously for appendicitis
32. Haberer (19)	1930	21	M		+		Bleeding duodenal ulcer	Two duodenal ulcers. Bleeding ulcer of Meckel's diverticulum	Gastric mucosa present	Recovered	
33. Cobb (7)	1931	18	M	+	+	+	Acute appendicitis	Punched-out, perforated, marginal ulcer,—walled-off	Ulcer at junction of gastric and ileac mucosa	Recovered	
34. Tavernier and Guilleminet (53)	1931	10	F		+		Possible ulcer of Meckel's diverticulum	Small round ulcer at base	Gastric mucosa distal to ulcer	Recovered	Pre-operative X-ray series negative

TABLE I.—DEFINITE PEPTIC ULCER CASES WHICH HAVE BEEN CONFIRMED MICROSCOPICALLY—Concluded

Author	Year	Age	Sex	Symptoms			Pre-operative diagnosis	Gross findings	Histological findings	Result	Remarks
				Pain	Intestinal hæmorrhage	Acute abdomen					
35. Lindau and Wulff (30)	1931	15	M	+		+	Peritonitis	Peritonitis. Perforated ulcer found at autopsy	Chronic perforating ulcer adjacent to gastric mucosa	Died	
36. Greenwald and Steiner (17)	1931	15 wk.	M	+	+	+	Perforated ulcer of Meckel's diverticulum	Punched-out perforation near base	Areas of gastric mucosa	Died	X-ray examination showed air below the diaphragm
37. Buechner (5)	1931	8	F	+				Chronic ulcer at neck of diverticulum	Gastric mucosa present	Recovered	
38. Hudson and Koplik (23) (Case 12)	1932	6	M	+	+	+	Peritonitis	Perforated ulcer. Peritonitis	Ulcer at junction of gastric and ileac mucosa	Died	Perforated under observation
39. Hudson and Koplik (23) (Case 31)	1932	5½	M	+	+			Sigmoid full of blood. Inflamed diverticulum	Inflammation and superficial ulceration. Gastric and ileac mucosa	Recovered	
40. Vaughn and Singer (58)	1932	7	M	+		+	Acute appendicitis	Walled-off acute perforation	Ulcer at junction of gastric and ileac mucosa	Recovered	
41. Mason and Graham (31)	1932	9 mo.	M		+			Meckel's diverticulum 6 cm. long	Chronic ulcer at junction of gastric and ileac mucosa. Pancreatic tissue at tip	Recovered	
42. Roudil and Marty (43)	1932	7	M	+		+	Peritonitis,—appendiceal	Adherent mass. Lentil shaped perforation at base	Gastric mucosa present	Died	
43. Wulff (60)	1932	16	F					Chronic peptic ulcer at base	Gastric mucosa present	Recovered	
44. Hudson (24) (Case 1)	1933	11	M	+	+		Not given	Blood-filled diverticulum. Blood in small intestine	Acute ulcer at junction of gastric and ileac mucosa	Died	
45. Hudson (24) (Case 3)	1933	6 mo.	M	+	+	+	Peritonitis	Perforation and inflammation of diverticulum. Peritonitis. Blood in peritoneal cavity.	Gastric mucosa present	Died	
46. Dragstedt (10)	1933	17	M	+	+		Ulcer of small intestine or cæcum	Chronic perforating ulcer	Diverticulum lined with gastric mucosa	Recovered	
47. Johnston and Renner*	1933	18 mo.	M	+		+	Acute appendicitis	Acute lentil shaped perforation at base sealed against abdominal wall	Ulcer at junction of gastric and ileac mucosa	Recovered	
48. Johnston and Renner*	1933	15 mo.	F		+		Ulcer of Meckel's diverticulum	Superficial ulcer at base	Superficial shallow ulcer at junction of gastric and ileac mucosa	Recovered	

*Reported in this article.

perforation and an acute surgical abdomen as the initial symptom of the condition.

CASE 1. The patient was a female infant 15 months of age. She had been a full term infant of normal delivery. Except for jaundice the first week and some feeding difficulties during the first 2 months of life she was well until the age of 9 months when she passed a stool which was full of blood, following which she was so weak and pallid that she was taken to a hospital in another city where she remained 8 days. She recovered from her anæmia, and 2 months later she developed pneumonia, after which she was well up to the time of her present illness.

On July 3, 1932, at the age of 15 months, suddenly, without pain or colic, she passed a stool containing a large amount of red blood. She passed a similar stool that evening. There were no other symptoms. On the morning of the second day she passed blood again, which this time gave the stool a very dark red color, almost a tarry appearance. This stool was saved for examination and it contained about 2 ounces of clotted blood. One of us (G.R.) was at this time asked to see her and after a preliminary examination he sent her to the Good Samaritan Hospital with a provisional diagnosis of ulceration of Meckel's diverticulum.

Examination revealed a well nourished infant, exceedingly pale, but without any other signs of acute illness. The pallor was the only positive finding. The abdomen was negative. Rectal examination revealed no polypi. The temperature was 100 degrees, the red blood cell count, 1,550,000, the white blood cell count, 5100; the hæmoglobin 35 per cent; and the bleeding time and clotting time were within normal limits. An immediate blood transfusion, and a second transfusion 6 days later, raised the hæmoglobin to 80 per cent. A roentgenological examination of the gastro-intestinal tract was negative. Eight days after admission, a laparotomy was performed with a pre-operative diagnosis of peptic ulcer of Meckel's diverticulum.

At operation a diverticulum 1 inch long was found on the ileum about 14 inches above the cæcum. Its peritoneal surface appeared normal. The diverticulum was excised with a narrow cuff of intestinal wall, and an appendectomy was also done. The infant's convalescence was uneventful. Examination of the diverticulum revealed a small clean-cut superficial ulcer about 5 millimeters in diameter located at the base of the diverticulum and extending into the intestinal mucosa. Microscopic examination revealed the ulcer located at the junction of gastric and ileac mucous membranes. The entire mucous membrane of the diverticulum was of gastric character, that in the proximal half resembling pyloric glands, and that in the distal half fundus glands with chief and parietal cells. The floor of the ulcer was covered with thin exudate and the wall of the diverticulum in this region showed some evidence of chronic inflammation.

CASE 2. The patient was a healthy well nourished male infant 18 months of age, with no history of previous illness. The night before admission to the Good Samaritan Hospital he awakened with intense abdominal pain. After crying for 2 hours he went to sleep. The following morning, January 18, 1932, he vomited twice and appeared to have abdominal discomfort. One of us (G.R.) was then called and after an examination he sent the child to the hospital with a diagnosis of acute appendicitis.

The temperature was 100.6 degrees, pulse, 144, and respiration, 28. The patient appeared distressed and the thighs were drawn up. The abdomen was of normal contour. In the lower right quadrant there was definite local tenderness and moderate muscle spasm. Rectal examination was negative. The white blood cell count was 14,700 with 65 per cent polymorphonuclear leucocytes. An immediate operation was decided upon.

Operation revealed some slightly turbid, straw-colored peritoneal fluid. On insertion of the forefinger, a small mass was felt which had so recently adhered to the anterior abdominal wall that it was freed at the first touch and presented into the wound. This mass was a Meckel's diverticulum 1 inch long, located on the lower ileum about 18 inches from the ileocæcal junction. At its base was a punched-out, lenticular perforation, which had adhered to the abdominal wall promptly enough to prevent a frank peritonitis. The comment was made by the operator (L. B.J.) that the perforation resembled the acute perforations seen at or near the pylorus. The diverticulum was excised with a narrow cuff of intestinal wall, and an appendectomy was also done. The patient recovered promptly. Subsequent pathological examination revealed that the mucosa of the diverticulum was definitely of gastric character, and the fundus-like glands contained chief and parietal cells. The acute perforation was located in a small chronic ulcer at the junction of gastric and ileac mucous membranes. The fibrotic thickening of the wall in the region of the ulcer indicated that it was a chronic one.

We have found in the literature a total of 78 cases which we have grouped as follows (see Tables I, II, and III): Group I includes 48 cases of definite ulcer in which gastric, duodenal, or pancreatic mucosa was definitely demonstrated. Group II includes 14 cases which in clinical and gross pathological findings quite definitely belong in the peptic ulcer group, but which were not examined histologically. In Group III are 16 cases, some with and others without gastric mucosa, all lacking demonstrated ulcers except 2 cases reported by Stern as phlegmonous perforations. It is quite probable that most of these cases belong in the peptic ulcer group, but we have not included them in the compilation of our statistics.

There is usually a single ulcer, found commonly in a short diverticulum. With few exceptions the ulcer has been located at the base of the diverticulum at the junction of gastric and ileac mucous membranes, and extending into the ileac rather than into the gastric mucosa. In some instances the ulcer at the base has been termed an *ileac* ulcer, but the term *marginal* is used most frequently and is more descriptive, because the ileac mucosa generally extends for a short distance into the base of the diverticulum. Occasionally multiple ulcers are seen as in the cases of Moll, Schmidt, and Peterman and Seeger. In the cases of Taylor, and Peterman and Seeger definite ileac ulcers were described; in the latter case and also the case of Meiss an ulcer at tip of diverticulum had perforated the ileum at a higher level. The chronic type of ulcer is usually found, typical cases of which are those of Meiss, Schmidt, Dragstedt, Peterman and Seeger, Vaughn and Singer, and our Case 2. Infrequently superficial ulcers are recorded, such as Hudson's (24) Case 1, and our Case 1.

TABLE II.—DEFINITE ULCER CASES—WITHOUT HISTOLOGICAL EXAMINATION

Author	Year	Age	Sex	Symptoms			Pre-operative diagnosis	Findings	Result	Remarks
				Pain	Intestinal hæmorrhage	Acute abdomen				
1. Denecke (9)	1902	7	M	+		+		Perforation at "throat," partially walled-off	Died	
2. Hilgenreiner (21)	1903	18	M	+	+	+	Perforated appendix	Chronic penetrating ulcer adherent to parietes. Histological examination and woodcut indicate that it was a peptic ulcer	Recovered	Not recognized as peptic ulcer by the author
3. Brentano (4)	1904	24	M	+		+	Appendicitis	Basal perforation with local abscess	Recovered	
4. Griffith (16)	1914	19 mo.	M	+	+		Autopsy	Perforation with local abscess. Ulcer at tip	Died	
5. Jackson, R. H. (27)	1924	10	M		+		Surgical abdominal condition	Marginal indurated ulcer with eroded vessel	Recovered	Thought to have been a tuberculous ulcer
6. Stulz and Woringer (52)	1925	4	M	+	+	+	Ileus. Peritonitis	Perforated ulcer at base. Peritonitis	Died	Closure only at operation
7. Stulz and Woringer (52)	1925	11 mo.	M	+	+	+	Autopsy	Perforated ulcer. Walled-off retroperitoneal abscess	Died	
8. Abt and Strauss (1) (Case 2)	1926	11 mo.	M		+			Ulceration at tip of diverticulum	Recovered	
9. Moll (37)	1926	5 mo.			+		Intestinal polyp	Giant diverticulum with 2 chronic ulcers at base	Died	Overlooked at operation. Discovered at autopsy
10. Fuss (14)	1926	37	F	+	+		Bleeding gastric ulcer	Sharply demarcated ulcer. Mesenteric adenitis	Recovered	
11. Kleinschmidt (28)	1927	45	M	+	+	+	Tumor	Perforated ulcer at tip,—adherent	Recovered	
12. Shannon (48)	1928	18 mo.	F		+		Ulcer of Meckel's diverticulum	Ulcer at base perforating against bladder wall	Recovered	
13. Schwarz and Daly (47)	1929	8	M	+	+	+		Ulcer with eroded vessel	Recovered	
14. Smith and Hill (49)	1929	14 mo.	M	+	+	+	Intestinal obstruction	Partially walled off perforation at tip and intestinal obstruction	Recovered	Authors interpret their case as a peptic ulcer with diverticulitis and obstruction

TABLE III.—PROBABLE PEPTIC ULCER CASES

Author	Year	Age	Sex	Symptoms			Pre-operative diagnosis	Gross findings	Histological findings	Result	Remarks
				Pain	Intestinal hæmorrhage	Acute abdomen					
1. Stern (50)	1917	5½	F	+		+	Peritonitis	Perforation near base	Phlegmonous perforation. Large bowel mucosa	Recovered	
2. Stern (50)	1917	3	M	+	+	+	Peritonitis	Perforation at base	Described as phlegmonous perforation. No mention of gastric mucosa	Died	Perforation occurred 4 days after first bloody stool
3. Abt and Strauss (1) (Case 3)	1926	11 mo.	M		+			18-inch diverticulum filled with blood	Gastric mucosa not described. The writers state that gastric mucosa and ulcer may have been overlooked	Recovered	
4. Stone (1)	1926	14 mo.			+			Diverticulum adherent to umbilicus	Pancreatic mucosa. No ulcer described	Recovered	Died later with severe diarrhœa
5. Mayo and Johnson (33)	1926	15	M		+		Intestinal hæmorrhage of unknown etiology	Inflamed diverticulum	One polyp and thickened submucosa. No mention of ulcer or gastric mucosa	Recovered	
6. Tisdall (55)	1928	11 mo.	M		+		Not operated. Died with respiratory infection. Autopsy	Giant diverticulum	Gastric mucosa present. No ulcer	Died	
7. Winkelbauer (59)	1929	19 mo.	M		+		Intussusception	First operation: incarcerated intestine due to adherent diverticulum. Second operation for recurrent bleeding: peptic ulcer of diverticulum	Neither gastric mucosa nor pancreatic tissue found	Recovered	
8. Hudson and Koplik (23) (Case 2)	1930	18 mo.	M		+			Blood filled diverticulum	No histological data	Recovered	
9. Hudson and Koplik (23) (Case 16)	1930	10	F	+	+			Blood filled diverticulum. Blood in intestine	No histological data	Recovered	
10. Hudson and Koplik (23) (Case 18)	1930	13 mo.	F	+	+			Meckel's diverticulum	Diverticulum was not removed	Recovered	
11. Hudson and Koplik (23) (Case 20)	1930	15 mo.	F	+	+			Meckel's diverticulum	No histological data	Recovered	
12. Hudson and Koplik (23) (Case 32)	1930	5½	F	+	+		Meckel's diverticulum	Meckel's diverticulum—injected	Acute inflammation and gastric mucosa	Recovered	
13. McKeen (40)	1932	53	M	+	+		Duodenal ulcer (X-ray)	Adhesions about gall bladder and duodenum. Perforating ulcer of diverticulum adherent to colon	Typical ulcer at tip. Ileac mucosa	Recovered	
14. Hudson (24) (Case 4)	1933	11	F	+	+		Appendectomy 1 year previously. Recurrence of pain and melena	Small diverticulum. Chronic inflammation	Gastric mucosa present. No ulcer found	Recovered	
15. Hudson (24) (Case 11)	1933	1	F		+			Blood filled diverticulum. Blood in intestine	Gastric mucosa present. No ulcer or inflammation	Recovered	
16. Hudson (24) (Case 2)	1933	3 mo.	M		+			Intramesenteric diverticulum 30 inches long. Connection with ileum not demonstrated	Gastric mucosa present	Recovered	

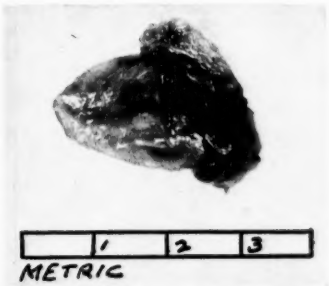

Fig. 1. Case 1. A photograph of the diverticulum which was excised with a narrow cuff of intestinal wall.

Fig. 2. Case 1. A slightly retouched photograph of the interior of the diverticulum shown in Figure 1. A shallow superficial ulcer is seen at the junction of the diverticular and intestinal mucous membranes. The ulcer extends into the intestinal mucosa. The mucosa of the diverticulum is intact.

The process of hæmorrhage, which is described in its clinical phase later in this paper, is probably more frequent in the chronic penetrating type of ulcer. In 5 instances grossly eroded vessels have been described. In 4 cases gross blood was observed in the intestine or large bowel at the time of operation and in the cases of Ulrich, Peterman and Seeger, and Hudson (24) (Case 3) bleeding occurred into the peritoneal cavity at the time of perforation. Our Case 1 and Hudson's (24) Case 1 prove quite conclusively that massive hæmorrhage may occur from very superficial ulcers or erosions of the mucous membrane. The fact that months or even years may elapse between hæmorrhages indicates that an ulcer may be quiescent over a long period, and very likely there is in such cases temporary complete healing of the ulcer. Certainly in our Case 1, which had suffered a massive hæmorrhage 6 months before the one which brought her to our attention, there was little evidence of a chronic type of ulcer. It is our belief, as has been suggested by one or two writers, that in some of the cases listed in Table III, in which ulcers were not found at operation, any one of three conditions must have existed: (1) the ulcer or erosion may have been so superficial that it was overlooked; (2) a superficial erosion may have healed previous to operation; (3) the ulcer may have been located in the ileum where it was not seen.

Perforation, which may be either an acute or chronic process, has occurred in more than one-half of the cases reported. The acute perforation appears as a punched-out lentil shaped opening in or near the crevice at the base of the diverticulum. Except for its shape it strikingly resembles the acute perforation of a gastric or duodenal ulcer. Many of the acute perforations have resulted in general peritonitis, but, as pointed out by Vaughn and Singer, the conditions are more favorable to immediate plugging or sealing than in similar perforations of gastric and duodenal ulcers. Because of the small size of the perforation and the mobility of the diverticulum, the hole may be plugged by mucus or fibrin, sealed by omentum or a loop of intestine, or by adhesions to the abdominal wall. In addition to our case we have listed in this group the cases of Gramen, Etchegorry, Peterman and Seeger, Achsner and Karelitz, Vaughn and Singer, and Smith and Hill. Certainly a number of the other walled off perforations, if all the facts were known, probably could be added to this group. It is quite definite, however, that walled-off perforations are often the result of a chronic slow process. Some cases of walled off perforations have proceeded to the formation of peritoneal, mesenteric, or retroperitoneal abscesses. Intestinal obstruction has also followed local abscess formation.

The close analogy of the peptic ulcer of Meckel's diverticulum to the jejunal ulcer located at a gastro-enterostomy stoma has been suggested by several writers. Huebschmann was the first to make such a comparison. Guibal says that Meckel's diverticulum behaves like a miniature stomach. Stulz and Woringer state that the boring quality of the ulcer is demonstrated not only by the fact that it rapidly reaches the serosa and perforates, but also by its tendency to hollow out a niche in the mesentery, or to penetrate the abdominal wall after adhesions are formed. They feel that in this respect the analogy with duodenal or gastrojejunal ulcer is perfect. Haberer has reported the coexistence of two duodenal ulcers and an ulcer of Meckel's diverticulum. Schreuder reports a case of Meckel's diverticulum ulcer in which the outer aspect of the pylorus led the operator to do a pyloric resection, but no definite pyloric ulcer was found in the specimen. In their

Fig. 3. Case 1. A low power magnification of a section of the diverticulum shown in Figures 1 and 2. The arrow points to the ulcer area. The cuff of intestinal mucosa is to the right of the ulcer. The entire length of diverticular mucosa to the left is shown by high power magnification to be gastric in type.

discussion of the genesis of peptic ulcer, Lindau and Wulff express their belief that the process in Meckel's diverticulum supports the biochemical theory of the origin of peptic ulcer. Matthews and Dragstedt have produced typical chronic ulcers of the Meckel's diverticulum type by anastomosing small Pavlow pouches to the lower end of the ileum.

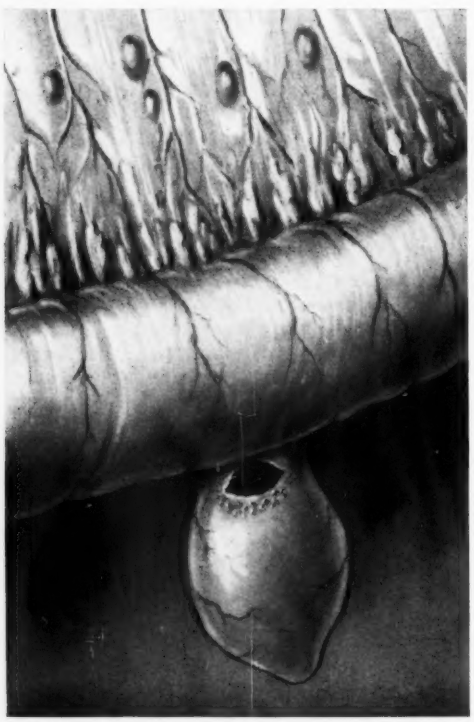

Fig. 4. Case 2. A semi-diagrammatic drawing showing the punched-out lenticular perforation at the base of the diverticulum.

The condition is much more common in the male. Of the definite ulcer cases (Tables I and II) 49 were in males, 9 in females, and in 4 the sex was not stated. Although the age varied from 5 months to 45 years, the ulcers are predominately in infants and children. Nine, or 14 per cent, were less than 1 year; 12, or 19 per cent, were 1 and 2 years; 3, or 5 per cent, were 3 and 4 years; 14, or 23 per cent, were 5 to 10 years; 15, or 24 per cent, were 11 to 16 years; and 7, or 11 per cent, were 16 to 45 years. The age was not given in 2 cases.

Intestinal hæmorrhage is the most constant symptom of this condition. While in some instances only a few tarry or slightly bloody stools are passed, the hæmorrhage, however, is usually a massive one. The bloody stool may vary in color from bright red to black, although it is usually of a dark red color. Collapse may result from a single massive hæmorrhage, or a succession of lesser hæmorrhages may reduce the patient within a few days or weeks to a state of extreme anæmia, in which condition perforation is very prone to occur. If the child does not develop a perforation he is likely to recover and then after the lapse of weeks, months, or even years, to suffer a recurrence of the hæmorrhages. This tendency to recurrence is a striking characteristic of this condition. After a typical massive hæmorrhage the hæmoglobin may be reduced to 20 per cent or 30 per cent and the red blood cell count to 1,500,000. All of the cases listed in Tables I and II have given a history of intestinal hæmorrhage, except 11 cases of acute perforation, in which the perforation was the initial symptom of the condition.

Next to hæmorrhage the most frequent complication is perforation, the process of which we have

Fig. 5. Case 2. Low power magnification of a section cut through the diverticulum. This section shows a cuff of intestinal mucosa, the acute punched out perforation, and the fibrotic thickened wall of the diverticulum. The mucous membrane of the diverticulum is of gastric type.

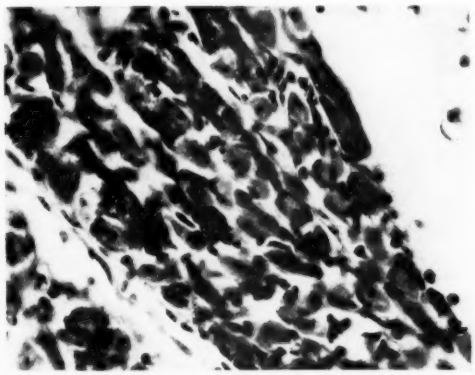

Fig. 6. Case 2. High power magnification of the mucous membrane of the diverticulum illustrated in Figures 4 and 5, showing the fundus type of gastric glands with chief and parietal cells.

already described. In 5 cases perforation developed while the infant or child was under observation for intestinal hæmorrhage. Of 62 cases with definite ulcer formation, 37, or 59 per cent, have perforated. Of the 37 cases of perforation 7 cases, or 19 per cent, were acute perforations which quickly became sealed or plugged, 18 cases, or 49 per cent, were acute perforations with peritonitis, and 12 cases, or 32 per cent, were walled off perforations, some of which resulted in local abscess formation.

Prior to perforation, symptoms other than intestinal hæmorrhage are generally lacking. In several cases in older children or adults there have been symptoms of abdominal distress. Unless the inflammatory changes about a chronic ulcer have reached the visceral peritoneum there is no pain, rigidity, or tenderness, but there may be a colic-like distress at the onset of a massive hæmorrhage. This colic is not as acute as in intussusception and it quickly subsides. In some instances large hæmorrhages may be unassociated with appreciable distress. The walled off perforations are characterized by variable degrees of tenderness, rigidity, and distention. A local abscess when present has seldom been large enough to form a palpable mass. The diagnosis in this group has frequently been appendicitis, appendiceal abscess, or intussusception. The acute perforation followed by diffuse peritonitis presents the usual picture of a very acute surgical abdomen. Cases in this group and the walled-off perforative group, if associated with or preceded by massive intestinal hæmorrhages, may with considerable certainty be given a diagnosis of perforation of peptic ulcer of Meckel's diverticulum.

In the differential diagnosis the blood dyscrasias are easily eliminated. Bleeding time and clotting time are normal. The blood picture is that of an acute secondary anæmia. In the cases with perforation, a leucocytosis is present. Duodenal or gastric ulcers are eliminated by the absence of digestive symptoms and by a negative roentgenological study. The Meckel's diverticulum can not ordinarily be demonstrated by the X-ray, because the barium does not enter it. The only case on record which was demonstrated by the X-ray is Case 23 in the series of Hudson and Koplik. The diagnosis of intussusception is eliminated by the lack of obstructive signs, the lack of intense colic, the absence of a palpable mass, and the absence of mucus in the bloody stool. Rectal polypi may be excluded by palpation or proctoscopic examination. The other common pathological conditions of Meckel's diverticulum—acute diverticulitis, gangrene, and intussusception, as well as intestinal conditions such as obstruction, intussusception, and polypi—may be associated with some evidences of intestinal bleeding, but they usually do not produce the recurrent massive hæmorrhages seen in ulcer of Meckel's diverticulum.

To date, in addition to our Case 1, ulcer of Meckel's diverticulum has been diagnosed previous to operation by Jackson, Peterman and Seeger, Shannon, Hudson and Koplik, and Greenwald and Steiner.

The treatment of peptic ulcer of Meckel's diver-

TABLE IV.—MORTALITY

	Cases
I. Ulcers not perforated	
Operated upon	22
Recovered	20
Died (1 not discovered at operation)	2
Not operated upon	3
Died (1 of other causes)	3
II. Perforated ulcers	7
Acute perforations quickly walled off (all operated upon, all recovered)	7
Acute perforations with peritonitis	18
Operated upon	17
Recovered	7
Died (2 not discovered at operation)	10
Not operated upon, died	1
Walled off perforations, with or without local abscess	12
Operated upon	10
Recovered	8
Died	2
Not operated upon, both died	2

ticulum is obviously surgical. In the cases with hæmorrhage an exploratory operation is indicated after preliminary blood transfusions. While it is true that a number of very anæmic patients have developed acute perforation while under observation, it is our opinion that the very weakened infant or child should be given the benefit of a few days rest and repeated blood transfusions, so that he may be a better operative risk. In our Case 2 blood transfusions during the week before operation raised the hæmoglobin from 35 to 80 per cent. It is extremely important, however, to insist upon operation at the earliest possible moment, and not to allow the patient's improved appearance to dissuade one from performing early exploration. In any case which has perforated, immediate operation is required, and also a blood transfusion when there is a definite anæmia present. In most cases the diverticulum can be excised with a narrow cuff of intestinal wall; in some a resection of a segment of the ileum is necessary. Table IV reveals an almost perfect surgical record in all types except the general peritonitis group in which the mortality was more than 50 per cent. The patients who were not treated surgically have nearly all died.

SUMMARY

Peptic ulcer of Meckel's diverticulum is a pathological condition which has its greatest incidence in male infants and children. The characteristic symptom is recurrent massive intestinal hæmorrhage. More than one-half of the cases have been complicated by perforation of the ulcer. In the group without perforation, the diagnosis is based upon the history of intestinal hæmorrhage, and except for anæmia, the lack of physical findings. The group with perforation presents a picture of local or diffuse peritonitis, and usually but not invariably have a history of recurrent massive intestinal hæmorrhages. The surgical record is exceedingly good in all cases except the group with general peritonitis.

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URINARY CALCULI ASSOCIATED WITH PARATHYROID DISEASE

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THE fundamental problem in the consideration of urinary tract calculi is the prevention of recurrence. When one considers the fact that the great clinics of the country report from 20 to 40 per cent recurrence in nephrolithiasis (13), the importance of this situation becomes evident. The fact that kidney stone, as well as bladder stone, is a symptom rather than a disease is well recognized at the present time. The surgical removal of the calculus without any attempt to discover the reason for its growth must lead to recurrence in many instances. Thus we are led inevitably to a discussion of the causes of urinary lithiasis.

This question of stone formation is extremely complex and has absorbed the interest of the physiologist, the biochemist, and the clinician. From the mass of experimental and clinical data gathered together on the subject, certain facts stand out as important.

First, as regards the urine itself, we know that here is the extraordinary phenomenon of an extremely supersaturated solution which does not obey the ordinary laws of chemical solutions (11). Substances excreted by the kidneys are but slightly soluble in water, as uric acid and calcium oxalate, uric acid being from ten to twenty times more soluble in urine than in water.

In a 24 hour amount of urine there is a greater quantity of salts than could possibly remain in solution in an equal volume of water. The ability of the urine to hold these salts in solution is said to be due to the presence in the urine of protective colloids. They prevent the precipitation of the salts and inhibit the formation of calculi. If the colloids are diminished in amount, or if their action is interfered with as by chemical changes such as occur in stagnant urine, the protective mechanism is lacking and the excess of free salts is precipitated with a resulting formation of urinary calculi. Again, as has been shown experimentally, a marked increase in the crystalline content of the urine at times apparently so adds to the burden put on the colloids that they are unable to perform their protective action. This was successfully demonstrated by Keyser who fed oxamid to rabbits and dogs and produced oxamid concretions in the kidneys. Despite such experiments, stones have not been produced in animals by feeding them an excess of their normal dietary constituents (3).

Stone formation in the urinary tract, then, is the result of an abnormal precipitation of the crystalline elements normally present in the urine. The causes of this abnormal precipitation are probably multiple, for as Randall points out, "We are practically forced to acknowledge that the chemical change that allows a pure uric acid stone to form, must differ from that whence an oxalate stone is crystallized. As the chemical results vary, so must the chemical cause."

There is considerable evidence that obstruction plays an important part in stone formation. Its rôle as regards bladder calculi can hardly be disputed, and it is probable that the same is true for kidney stones. In his oxamid experiments Keyser found that when obstruction to the ureter was artificially produced stones formed consistently and within a few days. Most of the clinicians who write upon this subject regard urinary stasis as fertile soil for subsequent stone formation. It is also true that in many long standing cases of marked obstruction, such as hydronephrosis from aberrant vessels, valves, or strictures, stones do not develop. But if in such instances a faulty metabolism adds markedly to the crystalline content of the urine it is reasonable to suppose that calculosis will result.

The importance of infection as a cause of stone formation is difficult to evaluate. Many stones develop in an uninfected urine, and, in many instances of severe and long standing sepsis of the urinary tract, stone formation never occurs. Urea splitting organisms inhabit the urine at times and phosphatic deposits frequently result, such as the incrustations in the bladder diseased by an alkaline cystitis.

Diets deficient in vitamin A, prolonged for some time, cause crystalline deposits in the urinary tract of laboratory animals (12). Ranganthan, in India, also found that stones produced on such diets to which calcium was added, were composed chiefly of calcium, while stones produced when lime was not added were composde of magnesium ammonium phosphate. The excretion of large amounts of calcium in the urine seemed to affect the composition of the stones. Such dietary deficiency experiments go far to explain the geographical incidence of stone, such as its prevalence in certain parts of India and China, or the frequent occurrence of calculi among children 50 or

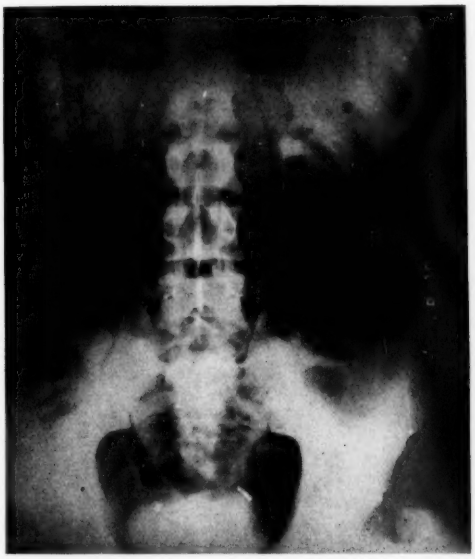

Fig. 1. Case 1. Intravenous pyelogram showing normal kidney pelves with a large stone in the right kidney pelvis.

Fig. 2. Case 1. Roentgenogram of femur showing normal calcification.

more years ago. They apply far less, however, to our own present problems.

It has been proved that the parathyroid glands affect calcium metabolism. Total extirpation of these glands causes a fall in the serum calcium and results in tetany. Within recent years it has been shown that tumors of the parathyroids cause marked metabolic changes with a loss of bone cal-

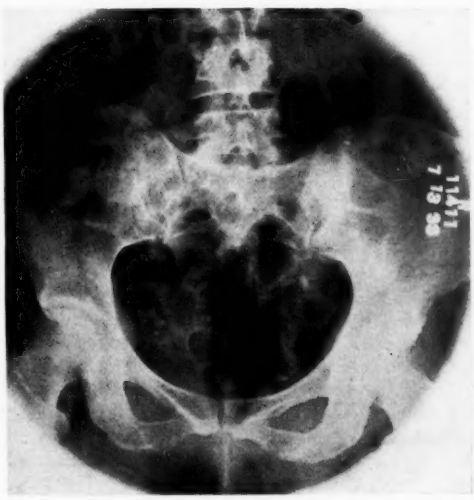

Fig. 3. Case 2. Stone low in right ureter. The bones show little if any change.

Fig. 4. Case 2. Radiographic catheter in place in same patient as in Figure 3. The stone has disappeared.

Fig. 5. Case 3. Large stone in right kidney pelvis. The bones show some decalcification.

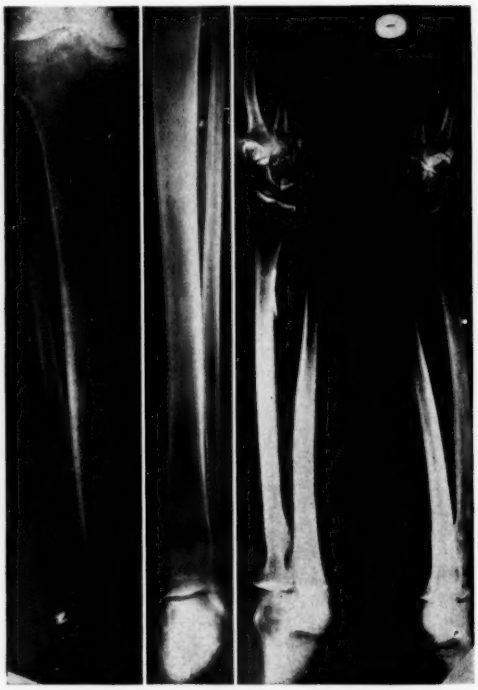

Fig. 6. Case 3. Well marked decalcification of the long bones.

cium, elevation of the serum calcium, and increase in the urinary output of calcium. The resulting bony changes decalcification, cysts, benign giant cell tumors, and spontaneous fractures characterize the condition known as generalized osteitis fibrosa (2, 4, 5, 10). Crystalline deposits occur in the urinary tract with such frequency in this disease that the association of the two is more than coincidence. In 28 cases of generalized osteitis fibrosa collected by Rankin, renal calculi were present in 5, or 18 per cent, and in 4 cases of his own described in detail, from which tumors of the parathyroids were removed at operation, renal stones were present in all. In 2 of these cases the stones were bilateral.

The pouring out of calcium from the body through the urinary tract seems to result in stone formation in many patients with hyperparathyroidism (1). Very likely the marked increase in urinary crystalloids in this condition places such a burden on the protective colloid mechanism of the urine that stones are apt to form. How important a place urinary stasis assumes in this evident tendency to stone formation in parathyroid disease is not yet determined, but there is evidence that obstruction is a considerable factor. Mandl recently describes experiments in which 10 guinea pigs were given 10 units of parathyroid hormone daily for 4 weeks. Artificial urinary obstruction was produced by compression of the urethra for from 7 to 12 hours a day. Eight animals lived and 3, or 37 per cent, developed crystalline deposits in the renal pelvis. At autopsy the other organs were essentially negative and stones had formed in none of the controls.

Parathyroid tumors have been removed from 13 patients at the Massachusetts General Hospital. In 8, or 61 per cent, demonstrable calcification was present in the urinary tract. There were 6 instances of renal calculi, 1 bladder stone, and calcification in the kidney parenchyma in 2 (once in a case of nephrolithiasis). Three of these patients had bilateral renal stones, a rather common condition in this disease. It is important that 3 of these individuals presented themselves to the hospital with the history of renal colic, hæmaturia, and other signs typical of kidney stone, and without the usual symptoms of generalized osteitis fibrosa. While one of the patients showed a certain amount of decalcification of the bones, in general such changes were not prominent and were quite overshadowed by the renal lesions. Probably an increased calcium intake maintained the calcium balance enough to prevent more

Fig. 7. Case 3. Parathyroid tumor removed from Case 3. Actual size, 1.5 by 1 by 1 centimeter.

extensive bone changes. The true condition was recognized in these 3 patients by discovering a high serum calcium and low serum phosphorus. These tests have been performed routinely in all cases of nephrolithiasis for some time at this hospital. As the association between urinary tract stone and parathyroid disease is more generally appreciated many more instances of a similar nature are certain to be recognized.

A report of 3 cases of nephrolithiasis associated with parathyroid disease serves to illustrate certain of these facts.

The first case is that of a 22 year old Italian-American shoemaker who entered the hospital in October, 1933, complaining of hæmaturia and intermittent pain in the right kidney region. Previously well, he first noticed bloody urine a year ago after extreme exertion or when fatigued. Seven months ago he was seized with an attack of severe right flank pain radiating to the testicle. He was taken to a hospital, had a cystoscopic examination, and 10 days later passed a stone. Since then he has had three attacks of pain and has passed three stones. Two weeks ago a similar pain on the left side radiated to the testicle. Physical examination showed a healthy young male with no abnormalities save tenderness about the right kidney. The urine contained a little albumin and many red blood corpuscles. Cystoscopy and pyelograms demonstrated normally functioning, uninfected kidneys with a moderate sized dense calculus in the right renal pelvis. The bones gave no evidence of decalcification. The blood calcium was 15.78 milligrams per 100 cubic centimeters and the phosphorus, 2.8 milligrams. On October 4, 1933, the renal calculus was removed through a pyelotomy incision. No obstructive lesions were detected and the patient did well. About 3 weeks later a tumor of the parathyroid was removed by Dr. E. D. Churchill. The tumor measured 1.7 centimeters in diameter, and on pathological examination was found to be an adenoma of the parathyroid.

This patient is interesting because the only symptoms present were referable to the urinary tract, yet this was a case of hyperparathyroidism. Had the true condition not been recognized by the routine estimation of serum calcium and phosphorus, and had a tumor of the parathyroids not been removed, undoubtedly, a rapid recurrence of the urinary stones would have followed. The entire absence of bone decalcification is also a noteworthy feature and may be explained by the fact that the patient's diet was very rich in milk.

Fig. 8. Photomicrograph of parathyroid tumor removed in Case 3.

Of more interest in certain respects is the case of a fifty-one year old married woman who entered the private ward of the hospital in June 1933.

Eleven years ago the left kidney was removed for extensive calculus disease. Since then she has occasionally passed gravel. Three years ago a stone was removed from the right kidney, and in May, 1933, X-ray examination showed a recurrent stone in this solitary right kidney. The blood calcium was 12.5, the phosphorus 2.19 and the patient was considered a case of hyperparathyroidism. A palpable tumor in the neck strengthened this point of view. During the next month the stone became impacted in the upper ureter, the patient was extremely ill and returned to the hospital. No urine was excreted for 48 hours, the non-protein nitrogen was elevated and the temperature was high. A hurried operation was performed to relieve the anuria. Upon exposure of the kidney, dense scar tissue was encountered everywhere. The kidney itself was dark and swollen, its parenchyma studded with miliary abscesses. The stone could not be found, nor was any extended search made for it. The obstructed kidney was relieved by a large nephrostomy tube. The patient gradually recovered after a stormy convalescence, nitrogen retention became normal and kidney function improved. The nephrostomy was considered probably as permanent in view of the extensive renal damage and existing stone. However, the stone gradually worked its way toward the bladder and, by the middle of August could be felt by vagina. X-ray examination of the bones showed no marked evidence of decalcification.

On October 7, 1933, Dr. Churchill explored the neck for a parathyroid tumor. The swelling previously noted proved to be an adenoma of the thyroid, but after a long, painstaking search a parathyroid adenoma was found in the region of the suprasternal notch and removed. Ten days later cystoscopy and X-ray examination failed to show the presence of the stone. The patient was in splendid condition and soon afterward the nephrostomy tube was removed to allow the wound to heal.

This second case is another example of an individual with hyperparathyroidism with outstanding symptoms of nephrolithiasis. The recurrence of stones, so common in this disease, nearly resulted in death. Here again noticeable bony decalcification was not a feature, and this may have been due to the fact that this patient had been on a gastric ulcer regimen for some time, thus keeping the calcium intake unusually high. A rather remarkable fact is the disappearance of the stone so soon after the removal of the parathyroid tumor. It is possible, of course, that the stone reached the bladder and was voided, although the patient was in the hospital at the time and its passage should have been noticed. Possibly the stone softened and was resolved into crystals. Whether or not the removal of the parathyroid tumor affected this cannot be said at the present. In other individuals with urinary tract stones, no difference in the size of the stones has been detected after the removal of a parathyroid tumor.

The third case is that of a 55 year old married woman who entered the hospital September 1, 1932, complaining of right flank pain of 5 years' duration. In 1927, the gall bladder had been removed without relieving the symptoms. During the past year severe pain came in more frequent attacks, and she became easily fatigued. Somewhat stiffened joints were said to have been due to rheumatism of many years standing. She often passed large quantities of urine. On physical examination, tenderness was present in the region of the right kidney. The blood pressure was 230/150. The urine contained both pus and blood. X-ray examination showed a large dumb-bell shaped calculus in the right kidney pelvis. In all of the bones abnormal trabeculation and decalcification were well marked. The right ilium and femur were distinctly smaller than the bones of the opposite side. The serum calcium was 12.7 to 13.2, the phosphorus was 2.55 to 2.78. The renal stone was easily removed by operation, and 1 month later a small adenoma of the parathyroid measuring 1.5 by 1 by 1 centimeter was excised.

The last patient's chief symptoms were also those of nephrolithiasis, but in this instance noticeable bone changes together with the high serum calcium and low phosphorus added to the suspicion of parathyroid disease, and aided in making the correct diagnosis. It is worthy of note that this individual very rarely drank any milk and that bone decalcification was marked.

CONCLUSIONS

Tumors of the parathyroid cause metabolic disturbances which result in a marked increase in the urinary output of calcium, a decrease in the output of phosphorus, and lead to the formation of stones in the urinary tract in many instances. While generalized osteitis fibrosa is frequently accompanied by urolithiasis, it is important to recognize the fact that stone formation occurs often in the urinary tract without any of the bone changes which characterize this disease, although tumors of the parathyroids are present and are the underlying cause of the stone formation. Unless the parathyroid tumor is removed stones will frequently recur.

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EXTRAPLEURAL PNEUMOLYSIS WITH PARAFFIN PACK

In the Treatment of Pulmonary Tuberculosis

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THIS paper is a report of 28 cases of pulmonary tuberculosis treated by extrapleural pneumolysis with paraffin pack. One can offer two excuses for the presentation of so small a series: (1) the operation has such narrow indications that for most the accumulation of a larger group would require many years, and (2) whereas in Europe the procedure has been used since 1912 and is gaining rapidly in popularity, in this country most have rejected it without trial on the basis that it is unsurgical.

HISTORY

In 1891, Tuffier (38), in resecting the apex of a lung which was the seat of tuberculosis, finding that the pleuræ were adherent, discovered that the lung could be easily mobilized by stripping the parietal pleura from the chest wall. He realized then that this offered a means of producing pulmonary compression, but it was not until 1910 that he so used it. In 1907, Schlange, confronted with a patient bleeding dangerously from an apical cavity, separated the adherent apex from the ribs and packed the extrapleural space with iodoform gauze. The hæmorrhage was controlled. In 1911, Tuffier (36) reported 6 cases of non-tuberculous pulmonary suppuration which he had treated in this manner, using homogenous and exogenous fat grafts to maintain the compression. In the next year he used the operation for the first time on a case of pulmonary tuberculosis. The operation attracted little attention until 1913 when Gustave Baer (4), ignorant of the work of Tuffier, reported a series of cases in which he had performed an extrapleural pneumolysis and filled the cavity with paraffin. Within the next year Sauerbruch (28), Wilms, and other German and Austrian surgeons adopted the operation and in 1914 Sauerbruch reported 28 cases. By 1920 he (29) had added only 12 more.

The operation was slow to gain adherents. Brauer and many others objected *a priori* to the foreign body and the early results were not encouraging. The indications and technique were poorly understood, complications were frequent, and the cures few. Sauerbruch, more than any one else, is responsible for its development and popularization. Confident that it had its uses and could be perfected, he persisted. At the present time he has performed the procedure more than 1000 times and is employing it more and more frequently. His experience and that of others has so clarified and developed the indications and so reduced the incidence of complications that within the past decade the operation has grown rapidly in favor. Brauer, so long opposed, has adopted it, and Baer (5), Schreiber and Stocklin, Ranzi, Tuffier (37), Hauke, Sachs and Sperl, Roth, Waltuch, Denk and Domanig, Kremer and Beitz, Alexander, Winternitz, Walzel, Behrens, and others in Italy and the Scandinavian countries have reported more or less extensive groups of cases. In this country most of the leaders of opinion in thoracic surgery have frowned upon, without trying, it and the literature to date consists of an imported article by Nissen, a report of observations in European clinics by Rogers, and a preliminary report of cases operated upon by Randolph. John Alexander has used it for several years and a record of his experiences is soon to appear.

THE INDICATIONS

The conditions for which the operation is now generally used are as follows:

1. Productive unilateral and bilateral apical lesions with single or multiple small cavities which do not extend below the fourth or fifth ribs at the spine and in which there is no active or progressing disease and no disease in remainder of lung.
2. Large cavities and more extensive lesions in cases in which the age or condition of the patient or disease in the opposite lung contra-indicate thoracoplasty.
3. Cavities which have remained open after complete thoracoplasty.
4. Hæmorrhage from apical cavities which cannot otherwise be controlled.

The first indication is the only one that has been disputed. Many have held that, when thoracoplasty was feasible, the operation should never be used. Sauerbruch (31) was long of this opinion, but has lately adopted it as the operation of choice for small apical cavities. As the complications have been reduced its advantages have demanded greater consideration. It is simpler, safer, and less deforming than thoracoplasty and is the only method of collapsing diseased, without sacrificing normal, lung.

It is my belief that the indications will be determined less by the complications than by the results. If statistics eventually show that it is relatively certain of closing cavities which would otherwise necessitate resection of more than 4 ribs, it will be the preferable procedure. I have found that when a cavity extends lower than the fourth rib at the spine, thoracoplasty is more certain to produce a satisfactory collapse. In doubtful cases, however, I am often influenced in favor of pneumolysis by the considerations that it may suffice, and that if it does not, a subsequent thoracoplasty will be more certainly effective. For very large cavities, those closed with difficulty by any procedure, I am now employing it as a preliminary to thoracoplasty.

THE TECHNIQUE

The operation, save in exceptional cases, is used to collapse the apex of the lung. The approach may be either from in front through the first interspace or second rib bed or from behind after resection of a segment of the third rib. Baer (6) believes that the choice of route should be determined by the location of the lesion. The anterior operation is the easier to perform since the chest wall can be reached by splitting the pectoralis major and the extrapleural space by separating the intercostal muscles. These considerations have led Schreiber and Stocklin, Sachs and Sperl, Starcke, Behrens, Maendl and Schwarzman, and many others to prefer it. The posterior operation, while it necessitates section of the muscles of the shoulder girdle and removal of a segment of rib, affords better access to the apex and far greater possibilities of securing a satisfactory collapse. Most surgeons who have had experience with both now use only this approach. Among these are Sauerbruch (29), Hauke, Winternitz, Kremer and Beitz, and J. Alexander. I have used the posterior operation 19 times, the anterior 8. All of the satisfactory results have followed the former.

The extrapleural plane having been located, the parietal pleura is stripped from the chest wall with the finger. The use of instruments favors injury to the lung. The stripping must be done with great gentleness and caution. If the pleuræ are not adherent the parietal layer may be torn. In some cases the inflammation has extended through both layers and rendered the outer one adherent to the endothoracic fascia, ribs, and intercostal muscles. Such adhesions tear less easily than the lung so that there is definite danger of pushing one's finger into the cavity he wishes to collapse. If dissection of the plane with the finger is not easily accomplished it should be abandoned. In many cases it is impossible to secure a satisfactory collapse. The extent to which the stripping is carried determines the size of the pack and some experience and judgment are required to make this fit the disease at hand. Hauke has emphasized the advisability of freeing the entire apex so that the upper half of the cavity may be inverted into the lower half.

The packing material: Many substances have been used to fill the extrapleural space and maintain the collapse. Tuffier (37) used fat, omentum, uterine fibromyomata, muscle, and Beck's paste. Tuffier, Riviere and Romanis, and Mayer have attempted to maintain an extrapleural pneumothorax. Archibald has inserted pedicled muscle grafts. Gewerder, Schoenlank, and Kroh have experimented with rubber balloons. Wilms used the segments of ribs removed at thoracoplasty. Brauer and Heine report favorable results from the use of vivacol and Eden has employed humanol, an oil prepared from human fat. Jessen has used a mixture of cera alba—vaseline and bismuth.

Many of these have proved entirely unsatisfactory and none of them has demonstrated its superiority to the paraffin mixture of Baer. This is the material now generally used. The formula is as follows:

Paraffin, melting point 48–50	100.0 gm.
Vioform	.2 gm.
Bismuth carb. neutr	1.0 gm.

The size of the pack: The incidence of complications has borne a definite relation to the size of the pack. Sauerbruch (29) at first attempted several complete pneumolyses and inserted as much as 2,000 grams of paraffin. Schreiber and Stocklin, and Hauke have used as much as 1,000 grams. The consensus of opinion today is that 600 grams should be the limit. Winternitz has had excellent results and has not used more than 350 grams. None of my packs has exceeded 600 grams.

The insertion of the pack: Prior to the operation the paraffin is melted and then cooled gradually so that when needed it is of the consistency of putty and can readily be molded. I first wash the cavity out with salt solution and then with a solution of iodoform in ether; the former to remove the blood and to make certain that the lung has not been perforated, the latter to dry and disinfect the surfaces. Small pieces of paraffin are inserted through the opening and molded into the recesses of the cavity until it is full. Packing in under pressure is apt to tear the lung, embarrass

the heart or great vessels, or compress the bronchus to the lower lobe.

Closure: Firm closure of the incision in the rib bed is essential. Small openings through which paraffin or serum may escape favor the extrusion of the pack.

THE COMPLICATIONS

The nature of the complications and their incidence are shown in the following chart.

	Cases	Per cent
Number of cases	528	...
Lung torn at operation	10	1.8
Pleura torn at operation	11	2.
Infection of pack	12	2.2
Extrusion of pack	7	1.5
Perforation of pack into cavity	18	3.3
Pack slipped	6	1.1
Pneumonia or atelectasis	13	2.3
Operative death	21	3.8

The causes of the operative deaths are shown in the following chart:

	Cases
Pneumonia	10
Infection	2
Circulatory failure	4
Meningitis	2
Unrecorded	3
Total	21

Fear of complications arising from the foreign body has led many to reject the operation. Although these accidents were at first common, they are now rare. It is significant that when they do occur they are not serious and rarely prejudice the patient's chances for recovery. Although in the first 40 operations reported by Sauerbruch (29) in 1920, 16 packs had to be removed because of infection, extrusion or perforation, in the remaining 488 operations the incidence of these complications has been but 5.5 per cent. In his last 50 operations Hauke has had no trouble from the foreign body and in my series there have been none save in those 3 cases in which at the time of operation it was known that the lung had been torn.

The complications may be classified as operative, postoperative, and late.

I. Operative complications
   a. Perforation of the pleura
   b. Perforation of the lung

II. Postoperative complications
   a. Infection
   b. Emphysema
   c. Serous effusion
   d. Pressure on heart or great vessels
   e. Aspiration pneumonia or massive atelectasis
   f. Tuberculinization

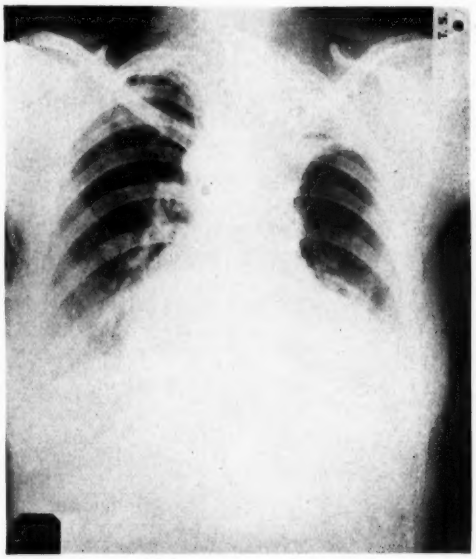

Fig. 1. Case 1. Large cavity at the apex of the right lung. Phrenicotomy failed to influence it.

III. Late complications
   a. Extrusion of the pack
   b. Perforation of the pack into the cavity
   c. Sliding of the pack

I a. Perforation of the pleura: The fact that the operation is indicated only when pneumothorax has been proved impossible makes this complication unlikely. If it does occur and the lung drops freely away, the wound should be closed without insertion of the pack and pneumothorax continued artificially. If the tear is into a localized pocket and the lung elsewhere adherent the accident may be disregarded.

I b. Perforation of the lung: Refusal to use force or instruments in an attempt to separate adhesions should eliminate this complication. Heretofore, when the accident occurred, the pack has been omitted and the wound tamponaded with gauze. This ensures a stormy and painful convalescence. In my cases I disregarded the tear and completed the operation. In each instance the immediate postoperative course was uneventful. In the two in which the pack was inserted from in front, serum appeared in the wound in the course of the second month. This finally evacuated itself and small pieces of paraffin were discharged. The patients had no fever. In each the pack was removed and at the same time the

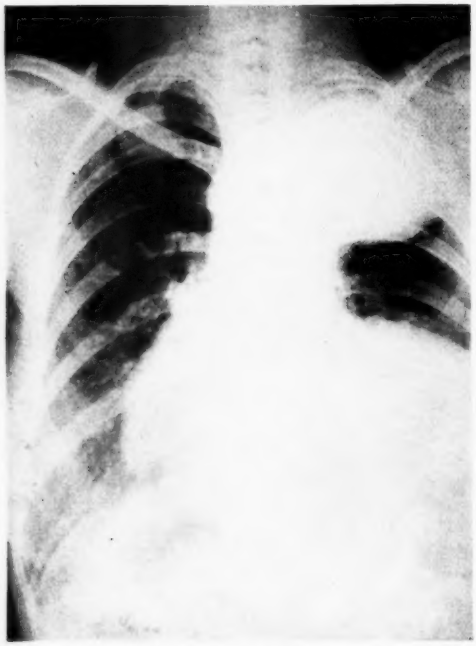

Fig. 2. Case 1. The cavity has been closed by a paraffin pack. The sputum has been negative for 1 year.

anterior stage of a thoracoplasty was performed. The results were satisfactory. In the case in which the pack was inserted from behind the wound remained sound, but several months later the patient began to expectorate small pieces of paraffin. Because the disease was incompletely collapsed, the pack was finally removed and a thoracoplasty performed. At the operation, filling the bed of the pack with fluid showed that the fistula was closed. The patient is now well.

II a. Infection in the wound: This is not and should not be more common than in clean wounds in which there is no foreign body. Occurrence of the complication calls for removal of the pack and dakinization of the wound. Nissen states that aspiration of the pus may lead to subsidence of the infection and retention of the paraffin.

II b. Emphysema: Baer (5) is the only one who has noted this complication. It occurs immediately after the operation in cases in which the lung has been injured. In one of mine an extensive subcutaneous emphysema subsided spontaneously. If pressure symptoms develop the wound must be opened and the pack removed.

II c. Serous effusion: It is probable that in every case a small amount of serum forms early about the pack. In some it is sufficient to appear on the roentgenogram as a halo about the denser paraffin. Winternitz observed this in 4 of 105 cases. In my series it occurred once. Kremer and Beitz believe that it is often the cause of a persistent fever. It should be aspirated only if it is copious, is causing symptoms, or seems to threaten the extrusion of the pack.

II d. Pressure on the heart or great vessels: This complication is rare and has been mentioned only by Sauerbruch (29). It occurs when large packs are put in under pressure. One of my patients had a transient dysphagia, apparently from pressure on the œsophagus, and another, transient signs of irritation of the sympathetic nerves on the operated side.

II e. Aspiration pneumonia or massive atelectasis: These are the most common and dangerous complications and practically the only ones that may cause the death of the patient or prejudice his chances for ultimate recovery. Pneumonia and atelectasis are most likely to occur in patients with abundant sputum and soft disease. H. Alexander and Winternitz have both suggested that lower lobe atelectasis may be caused by pressure on the bronchus. To prevent the complications the patient should be made to rid himself of the sputum before the operation. After the operation the foot of the bed should be elevated, opiates withheld, and cough encouraged.

II f. Tuberculinization: Sauerbruch (29) and Winternitz report instances of immediate severe intoxication. This they attribute to the flooding of the circulation with tuberculo-toxins incident to the sudden compression of the diseased lung. The symptoms are vomiting and prostration. The fever is high, the pulse small and rapid, and the blood pressure low.

III a. Extrusion of the pack: The pack may be extruded weeks or months after the operation. Without the developement of fever or other symptoms a fluctuant swelling appears in the wound. This may disappear spontaneously or after aspiration. In some cases it breaks through the skin with the evacuation of serous fluid and later of pieces of paraffin. A low grade infection ensues which necessitates removal of the pack. Riviere and Romanis, and Wilms each cite an instance of healing of the sinus and retention of the paraffin. Chaumiere and Loubat operated upon one case before the fluid perforated, removed a piece of paraffin which had worked out through the rib bed, and secured primary healing. Two of my packs were extruded, but in both instances it was known at the time of operation that the lung had been torn. Both followed the anterior operation.

TABLE I.—RESULTS

Operator	Cases	Negative sputum	Improved	Unimproved	Worse	Operative death	Late death	Not followed	Observed too short a period
Baer (5)	9	3	4	1		1			
Sauerbruch (29)	40	7	5	27		1			
Roth	11	4	6						1
Sachs and Sperl	8	3	5						
Schreiber and Stocklin	13	1	6	3	1	2			
Alexander, H.	20	6	12	2					
Winternitz	79	30	35			3	11		
Hauke	32	10	9	8	1	1	4		
Kremer and Beitz	22	10	9	1			2		
Ranzi	10	0	6		2	2			
Waltuch	15	7	2	4		2			
Denk and Domanig	30	10	2	4		4	3	1	6
Head	28	10	15	2	1	0	0	0	0
Totals	317	101	*238 81	*198 25	*198 5	16	20	1	7
Per cent		33	34	12.6	2.4	5.0	6.3	.33	2.2

*Total number of cases in which these data were recorded.

It is my belief that injury to the lung and unsatisfactory closure of the incision are the causative factors.

After removal of the pack the wound is tamponaded and allowed to granulate. In my cases I performed at the same time the anterior stage of a thoracoplasty. Nissen, and Kremer and Beitz report cases in which the temporary compression had permitted healing of the tuberculosis.

III b. Perforation into the cavity: This is a more common complication and may occur weeks, months, or years after the operation. Sauerbruch cites instances of its appearance after intervals of 4, 5, 6, 7, and 11 years. It may be caused by injury to the lung at the time of operation, by pressure necrosis of the cavity wall, or by extension of the tuberculosis. It is not associated with stormy symptoms. The patient simply starts expectorating small bronchial plugs of paraffin. This may stop, as in my case and in ones reported by J. Alexander, and Kremer and Beitz. If fever develops or the expectoration of paraffin persists the pack must be removed. It has been customary to tamponade the wound and allow it to heal by granulation. I would risk a primary closure and if necessary, at the same time would do a thoracoplasty. In many cases the pack perforates long after the tuberculosis has healed. This was so in most of the 9 observed by Winternitz.

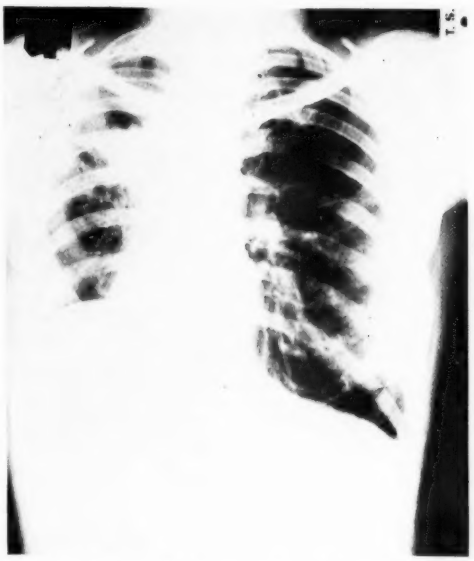

Fig. 3. Case 2. Very large cavity at the apex of the left lung; homolateral phrenicotomy, contralateral pneumothorax.

RESULTS

It is not reasonable to judge any operation by the results obtained during the period of its evolution or by the early results of any given operator. Only by group and individual experience can the indications be determined and the dangers recognized and avoided. What is a perilous course to the explorer becomes, once the shoals and reefs are charted, a safe channel for travel and commerce.

The results at present available show this operation during the period of its developement. In many instances too much was attempted, too vigorous efforts were made to separate adhesions, too large packs were used, they were put in under pressure, and too often the anterior operation was employed with the result that the collapse was limited and the closure of the wound unsatisfactory.

Even the statistics at hand are not so classified and analyzed that they are of more than general value. Like artificial pneumothorax, extrapleural pneumolysis is a trial operation. In many cases adhesions prevent a satisfactory collapse. Like artificial pneumothorax and phrenicectomy it is applicable and used in a great variety of situations for a great variety of purposes. One can ask only that it accomplish the purpose for which

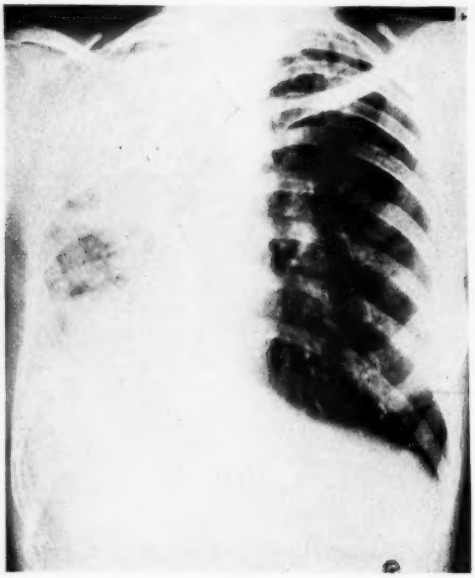

Fig. 4. Case 2. A paraffin pack has been inserted in an attempt to close the cavity. The sputum continued to show bacilli.

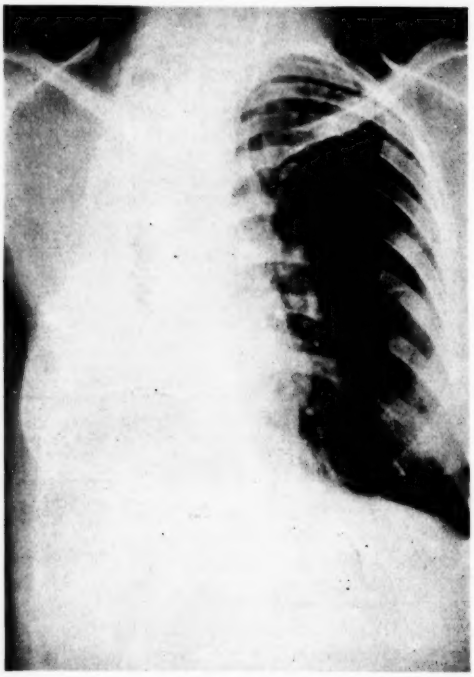

Fig. 5. Case 2. The paraffin has been removed and a thoracoplasty performed. The sputum has been negative for 11 months.

it was employed. It is not reasonable to expect that it will cure the patient or render the sputum negative when there is active disease in the opposite lung. Proper statistics, therefore, must include information on all of these points and the cases must be classified and reclassified according to the particular indications and the nature and distribution of the disease.

An approximation of the general results obtained by the different operators is shown in Table I.

Table I shows 33 per cent cured, 34 per cent improved, 12.6 per cent unimproved, 2.4 per cent worse, 5 per cent early deaths, 6.3 per cent late deaths, .33 per cent not followed, and 2.2 per cent followed too short a time. These results compare faborably with those of thoracoplasty. When one considers this and the fact that in a majority of these cases disease in the opposite lung or some other complication contra-indicated the larger operation, he must agree with Winternitz that the operation cannot be lightly discarded.

The results in a group of 89 unilateral cases presented in Table II shows 49 per cent cured, 35 per cent improved, 4.5 per cent unimproved, 2.3 per cent worse, 4.5 per cent dead, and 3.5 per cent of the patients observed for too short a period of time.

Kremer and Beitz were able to secure a satisfactory collapse in 38 of 48 cases. Twenty-two patients had been observed more than 1 year. Three of these who had had bilateral packs all still had bacilli in the sputum. In 5 other cases there was a cavity in the opposite lung. Three of these had a satisfactory contralateral pneumothorax and negative sputum. Of 6 cases with unilateral disease and satisfactory inversion packs, 4 had negative, 2 positive sputum. In 3 other cases the cavity was pressed against the mediastinum. All had negative sputum. Four cases had relaxation packs. Two of these died of tuberculosis and the other two still had bacilli in the sputum. In a total of 52 operations the results were satisfactory in 66.6 per cent. Of 12 cases observed one year following successful packs, 9 had negative sputum.

During the past 2 years I have performed a total of 30 operations upon 28 patients. Two had bilateral packs. The general results are shown in Table III.

In 18 instances the posterior operation was used, in 8 the anterior. In one the pack was

TABLE II.—RESULTS IN UNILATERAL CASES

Operator	Cases	Cured	Improved	Unimproved	Worse	Dead	Too short a period
Head	14	9	5	0	0	0	
Kremer and Beitz	13	7	4	0	0	2	
Roth	10	4	3	0	0	0	3
Sachs and Sperl	5	3	2	0	0	0	
Hauke	19	9	6	3	1	1	
Ranzi	8	3	2				3
Schreiber and Stocklin	3	0	3	0	0	0	
Waltuch	12	5	4	1	1	1	
Baer (5)	5	3	2	0	0	0	
Total	89	43	31	4	2	4	6
Per cent		49	35	4.5	2.3	4.5	7.0

TABLE III

	Cases
Operative deaths	0
Late deaths	0
Infection of pack	0
Pleura torn	0
Lung torn	3
Pack extruded	*2
Pack perforated	†1
Subcutaneous emphysema	†1
Effusion about pack	1
Massive atelectasis of lower lobe	2
Exacerbation of lower lobe disease	1
Spill into the opposite lung	0
Cured	9
Improved	15
Unimproved	3
Worse	1
Dead	0

*In both the lung was torn at operation.
†Lung torn at operation.

inserted at the base and in two, in which it was used to complete a thoracoplasty, through the axilla. No conclusions can be drawn from the statistics on this subject. Although all of the good results followed the posterior operation, the anterior was used in no ideal cases and in only two with unilateral disease.

In 6 cases the indications were ideal, the disease being limited to one apex and not extending below the fourth rib at the spine. In 10 the disease was unilateral but the cavities either large or the involvement extensive. In 9 there was active disease in the opposite lung and in 3 the operation was done to complete a thoracoplasty. The results in these different groups are shown in Table IV.

In 12 cases the operation accomplished the purpose for which it was used, in 9 it rendered the sputum negative, in 2 it improved the condition so that thoracoplasty could be performed, and in 1 it stopped repeated hæmorrhages. In 10, because of disease in the opposite lung, it is impossible to tell whether or not it has closed the lesion attacked. In 7 it failed to accomplish its purpose; in 2 because the pack was extruded, and in 5 because it failed to close large apical cavities.

TABLE IV

	Cases	Sputum negative	Improved	Unimproved	Worse	Dead	Operation accomplished purpose	Have had thoracoplasty	To have thoracoplasty	Sputum negative
Ideal cases	6	6	0	0	0	0	6	0	0	6
Large cavities	10	3	5	2	0	0	5	2	5	4
Bilateral cases	9	0	7	1	1	0	1	5	0	2
After thoracoplasty	3	0	3	0	0	0	1	0	0	0
Total	28	9	16	3	1	0	13	7	5	12

In none of the cases in which it failed has it prevented a subsequent thoracoplasty. It is my present belief that one of its chief uses will be as a preliminary operation. Not only will it improve the condition of patients too ill for thoracoplasty, but in the presence of large cavities, those closed with difficulty by any method, it will so decrease their size that a subsequent thoracoplasty will be more certainly effective.

SUMMARY AND CONCLUSIONS

Extrapleural pneumolysis with paraffin pack has a definite place in the surgical treatment of pulmonary tuberculosis. The complications caused by the foreign body, which have deterred many from using it, have been largely eliminated. When they do occur, they are rarely serious and rarely prejudice the patient's chances for recovery. It has the great advantages of being simpler, safer, and less deforming than thoracoplasty and of making a strictly localized collapse of diseased lung without sacrificing vital capacity. For these reasons it can be used in a large group of cases in which all other methods are either impossible, contra-indicated or have failed. It has thus increased appreciably the number of patients amenable to collapse therapy. Whether or not it should ever be used in preference to thoracoplasty is still a subject of dispute. Sauerbruch and Brauer, the leaders of opinion in Germany, have recently changed their ideas and now believe it the operation of choice for small apical cavities. It has been my experience that in cases in which the cavity does not extend lower than the fourth rib at the spine, it is reasonably certain of producing

the desired result. For larger cavities thoracoplasty is more certain. When the indications are doubtful, one may be influenced by the consideration that the lesser operation may suffice and that if it does not a later thoracoplasty will be more certainly effective for the partial collapse already provided. My results from such secondary thoracoplasties have been so good that at present, when confronted with a very large apical cavity, I am using a pack as a preliminary operation.

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THE INTRA-UTERINE DIAGNOSIS OF MONSTROSITIES

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EVERY obstetrician is all too cognizant of the shock and disappointment to the family for whom he has just delivered a monster. How much greater is the shock and disappointment when it occurs without a diagnosis previous to birth! In addition, is the fact that the known presence of a monstrosity may change the entire treatment. He who prides himself on the recovery of a woman upon whom he has done a cæsarean section only to deliver a monster, certainly has no obstetrical conscience.

There are only two means of absolute diagnosis of intra-uterine monstrosities available. First of these is by employment of roentgenology and the second by direct palpation of the abnormal condition vaginally. Only within the last 10 years has roentgenology been so perfected as to help us with this diagnosis. As it is needless expense to the patient to use the X-ray in every case of pregnancy, it is imperative to select those cases for study that show clinical signs or associations pointing to the presence of a monstrosity.

The frequent association of marked polyhydramnios with monstrosity has been known for years. Eleven years ago Greenhill called attention to the association of fetal monstrosities and placenta prævia. Undoubtedly many spontaneous abortions are associated with the presence of monstrosities as well as many cases of unexplained fetal death *in utero*. In 1928, Falls reviewed the literature on tentative and actual diagnosis of intra-uterine monsters and reported 10 cases; in 5 the diagnosis was definitely made before birth.

During the past 3 years the author has encountered 5 cases of monstrosities in all of whom fortunately a diagnosis was made before delivery. In 4 of the cases the diagnosis was made by the X-ray but in each case there was a definite indication for roentgenology either to confirm the tentative diagnosis or to assist in the diagnosis of intra-uterine death. The fifth case was one of teratocormus cyllosoma similar to that recently reported by Boulware and Flinn. Convulsive movements of the fetus and irregular fetal heart tones were not observed in any of the cases. Of the 5 mothers 3 had previously borne healthy babes and in no case was syphilis a likely factor.

CASE 1. G. P., Hospital No. C3407, primipara I. The patient's first visit to the prenatal clinic at the Coleman Hospital was July 28, 1931. She was then 21 years of age. Her past history was negative and she had had none of the infectious diseases of childhood. Her menses had started at 13 years, were regular and of 28 day type. The first day of her last period was April 5, 1931, making her due January 12, 1932. Blood pressure was 120–70, measurements were normal. Wassermann reaction was negative. Urinalysis was negative. Prenatal period was negative as to symptomatology. Notes as to abdominal palpation and weight were as follows.

Date	Position	F.H.T.	H.F.	WT.
8–25–1931	O.L.T.	140	20	88¾
9–22–1931	O.L.T.	140	14	93½
10–20–1931	?	144	23	98¾
11–17–1931	Breech	?	26.5	107¾
12– 1–1931	?	?	32	115¼

On the last date there was an acute polyhydramnios with marked tension of abdominal wall, preventing palpation. Patient was roentgenographed because of this fact.

X-ray report. Anteroposterior and lateral films of the abdomen and pelvis showed the bony outline of a rather small fetus. There was a very marked disturbance of the development of the bones of the fetal skull. We saw only the smaller bones of the face and base of the skull. The vault of the skull was entirely undeveloped. We noted also a marked splitting of the upper dorsal vertebræ. The appearance was that of a fetal monstrosity, probably of the type of craniorachischisis (Fig. 1).

Patient entered hospital December 1, 1931. The membranes were ruptured artificially at 10:00 a.m. December 3, 1931, 5300 cubic centimeters amniotic fluid were slowly removed. Pains began at 1:30 p.m. and the patient delivered a female anencephalic stillborn monster at 7:00 p.m. The puerperium was uneventful.

CASE 2. E. W., aged 28 years, a primipara, was first seen by me July 30, 1931. Her husband, both her parents, and 6 sisters were living and well. She had had measles, mumps, scarlet fever, and a tonsillectomy. Menses started at 14, were regular, and of the 27 day type. The first day of the last period was April 11, 1931, making her due January 18, 1932. On December 22, 1928 she had delivered an 8 pound 9 ounce girl spontaneously. General examination was negative. Local examination showed an acutely inflamed cervix and vagina, and the presence of Trichomonas vaginalis. The uterus was the size of a 3 months' pregnancy. Measurements were normal. Wassermann, Kahn, and Kline tests were negative. Her prenatal period was normal until at the visit on November 17, 1931, she reported slight headache with slight bleeding 2 days previously. Blood pressure was 120–70; weight 197.5. Height of fundus was 27 centimeters. The babe was active and fetal heart tones were 140. On November 30, 1931, the patient reported no fetal movements felt for 48 hours. There were no signs of toxæmia. No fetal heart tones could be heard by careful auscultation with the head stethoscope. Height of the fundus had dropped to 24.5 centimeters. Because of suspected fetal death, hospitalization was advised and patient entered the Methodist Hospital December 4, 1931. As no fetal heart tones could be heard after another careful examination, the patient was roentgenographed and a fetus with a maldeveloped head and apparently deformed thoracic cage was shown. After bag induction, a macerated female monstrosity of

Fig. 1. Case 1. Anencephalic monster.

a craniorrhachischitic type was delivered. The placenta was strongly attached to the uterine wall and required manual removal. Patient made an uneventful recovery; highest temperature 100 degrees; left hospital tenth day.

CASE 3. L. V., aged 29 years, ii-para, was first seen by me July 15, 1932. Her husband, both parents, and sister were living and well. She had had measles, mumps, whooping cough, and appendectomy. Menses started at 14; were of the 28 day type, and the first day of the last period was April 28, 1931, making her due February 4, 1932. She had delivered a 7 pound, 10 ounce, girl by breech extraction at Danville, Illinois, on November 10, 1928. General examination was negative. Measurements were normal. Prenatal period was uneventful, except that babe persisted in breech position, and all attempts at external version failed. Patient entered the Methodist Hospital on January 20, 1933, shortly after rupture of the membranes. There was no presenting part palpated by rectal examination, and because the part in the fundus, though feeling like a head, seemed to be much too large for one, the patient was roentgenographed. The roentgenologist made a definite diagnosis of hydrocephalic monster with breech presentation (Fig. 2). The situation was explained to the husband, as well as the operative treatment probably required. The patient was given castor oil, 1 ounce, and quinine sulphate, 5 grains. Pains started at 1:15 a.m. The breech was on the perineum at 5:00 a.m. the same day. Babe was extracted up to the head which was so large it would not enter the pelvis. After considerable difficulty, a craniotomy was done in the suboccipital region and extraction completed. Babe was a boy with large hydrocephalic head but no spina bifida. Mother made an uneventful recovery; highest temperature 99.4 degrees.

CASE 4. H. B., aged 17 years, primipara, was first seen at the Crittenden Home December 21, 1932. She had had none of the infectious diseases of childhood. Her menses started at 13 years, and the first day of the last period was

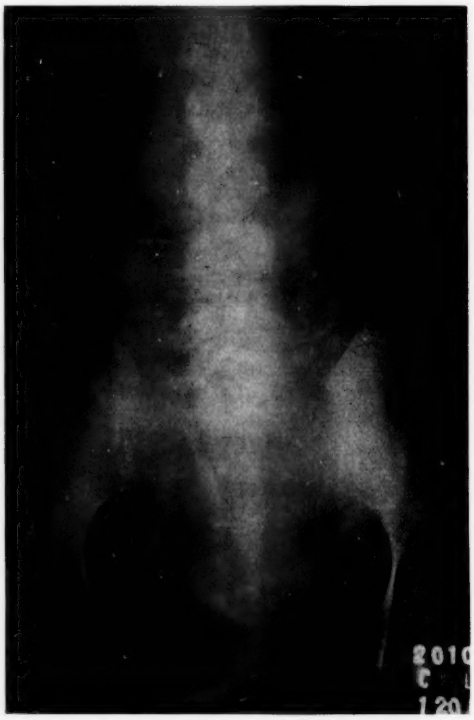

Fig. 2. Case 3. Hydrocephalic monster.

May 9, 1932, making her due February 16, 1933. Blood pressure was 130–80. General examination was essentially negative as were Wassermann, Kahn, and Kline tests. All findings were normal except my inability to make a clear cut abdominal diagnosis. Notations taken from her chart pertaining to abdominal examination follow:

Date	Position	F.H.T.	H.F.
1–11–1933	?	140	29
1–18–1933	O.L.T. (?)	140	30
1–15–1933	?	132	29.5
2–1 –1933	O.L.T. (?)	136	30
2–8 –1933	O.L.T. (?)	136	31
2–25–1933	O.L.T. (?)	132	32
3–21–1933	O.L.T. (?)	140	32

On the last date recorded above, rectal examination showed the pelvis to be empty. Abdominal examination did not demonstrate the presence of a head in the fundus. Monstrosity was suspected and patient was sent to the Methodist Hospital for X-ray examination. The latter showed definitely the presence of an anencephalic monster and was reported as such. Four days later the patient went into labor, and delivered spontaneously an anencephalic monster with a suboccipital meningocele the size of a cocoanut. The babe lived but a short time. Fetal heart tones had been within normal limits throughout labor and continued at a normal rate as long as the babe lived.

CASE 5. B. N., aged 38 years, viii-para, was admitted to the Coleman Hospital July 3, 1933. She was sent to us as an emergency case with a diagnosis of placenta prævia by her family doctor. She was having irregular pains and

some vaginal bleeding. Her membranes had ruptured at noon, July 1, 1933. She felt the babe move at midnight the same day, but had not felt movements since that time. She was about term, but no fetal heart tones could be heard. The abdomen was so tense that babe could not be outlined. I saw the patient after the resident reported that by internal examination, he felt something inside the cervix but was not sure what it was. Upon vaginal examination, we felt smooth tissue inside the cervix, which did not feel like placental tissue. The cervix was dilated about 5 centimeters. Putting slight traction on the tissue, bleeding was not increased and the tissue readily came down into the vaginal canal. A small amount of the tissue was delivered out of the vulva. On inspection it appeared like fetal bowel. A small loop was excised after ligation and both ends carbolized. The patient was allowed to labor, her general condition being satisfactory. Tissue was examined at the laboratory and a definite diagnosis of hæmorrhagic bowel made. We were then certain that we had a monstrosity with prolapse of the fetal bowel, and a partial abruptio placentæ was suspected. An X-ray film added nothing to our information, except that breech presentation, sacrum dextra anterior, and marked angulation of the spine and mild overlapping of some of the bones of the skull were shown. Patient delivered spontaneously, 10:40 p.m., July 4, 1933, the placenta being delivered simultaneously with the macerated babe (Fig. 3). The mother made an uneventful recovery.

Pathological report. The body for dissection is that of a white male (?), slightly premature macerated fetus. The head and all its parts, the thorax, and upper extremities appear normal. The abdominal contents are completely eviscerated. The placenta is still attached to this mass of abdominal contents. There is no anus and only a rudimentary penis. On the left thigh is a small wart like formation about the size of a pea. There are bilateral club feet. The skin over the entire fetus is scaly. Upon closer examination of the eviscerated portion, the loops of intestine are very imperfectly formed and have undergone considerable deterioration. In and about this portion are small rudimentary organs which grossly can be identified as liver, spleen, pancreas and one kidney. No bladder or genital organs can be demonstrated. The rudimentary penis has a urethra but no meatus. Upon opening the thorax, the lungs appeared normal. The right had three lobes and the left two lobes. Both lungs are atelectatic. The thymus is about normal size. The heart is well formed. The ductus arteriosus and foramen ovale are patent.

Anatomical diagnosis. Congenital malformation of abdominal viscera.

Fig. 3. Case 5. Teratocormus cyllosoma.

SUMMARY

Five cases of monstrosities *in utero*, diagnosed before delivery are reported. The first 4 cases were diagnosed by means of the X-ray and the last by direct palpation. The first case was examined by X-ray because of the presence of acute polyhydramnios. The second case was discovered because we were attempting to find X-ray evidence of fetal death. The third case was submitted to the X-ray because of the abnormally large fetal head, while the fourth was found because of careful frequent abdominal examinations revealing the absence of a demonstrable head either in the pelvis or in the fundus. The fifth case, diagnosed by direct palpation presented a very unusual condition. The importance of the subject is sufficient to require re-emphasis and the following conclusions:

CONCLUSIONS

1. The intra-uterine diagnosis of fetal monstrosity is to be highly desired.

2. Cases of suspected intra-uterine death should be roentgenographed. In addition to the cardinal findings of fetal death—overlapping of bones of the skull, acute angulation of the spine, and compression of the thoracic cage—often the presence of a monstrosity will be shown.

3. During the latter months of pregnancy, repeated abdominal examinations are urged. Failure to outline a normal fetal head abdominally or in the pelvis is a definite indication for X-ray examination, as is every case of marked polyhydramnios.

4. When possible, every candidate for cæsarean section should be roentgenographed and especially so in cases of placenta prævia.

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TREATMENT OF SUPPURATIVE OSTEOMYELITIS OF THE MANDIBLE

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THE method of treatment of suppurative osteomyelitis[1] of the mandible described in this paper was given trial because of the unsatisfactory results which had been obtained by the use of the more conservative plans.

A review of the records of 85 cases of suppurative osteomyelitis of the jaw, treated according to the conservative methods in the Peiping Union Medical College between the years 1922 and 1932 showed certain points of interest. In 90 per cent of the cases, the disease was of more than 3 months' duration when the patients were first seen. These cases were treated over periods varying from 2 months to 2 years (an average of 6.4 months), after which apparent healing occurred in only 39.1 per cent of the cases. In the remaining 61.9 per cent of the cases there was evidence of active infection of bone when the patients were last seen. These results proved disappointing, particularly in a group of cases in which so much time had been allowed for the separation of sequestra and the regeneration of bone.

The conservative method of treatment consisted, during the acute stage, in drainage of the abscess, and, during the chronic stage, in removal of the dead bone which had been allowed to separate spontaneously. Usually the infected teeth were not extracted until very late in the chronic stage. Radical operation was not attempted previous to the formation of new bone sufficient to maintain continuity. This necessitated a delay of at least 3 to 6 months, or until roentgenograms showed that sequestra had separated definitely, before the dead bone could be removed. The sequestra were removed through incisions either within the mouth or externally along the border of the mandible. Usually sinuses had formed both on the inside and on the outside of the mouth.

Most writers (especially Blair, Axhausen, Dunning, Wilensky) advise conservative treatment much the same as that described in the preceding paragraph. Several writers (Enderlin, Germain, Hardgrove) have advised opening of the bone during the early acute stage of the disease, but this procedure has been the subject of severe criticism, chiefly because of the danger of extension of the infection following operative trauma during the acute stage. Before the present plan had been developed, experience in one of our cases served to emphasize the necessity for caution when dealing with acute infections in this bone.

H.S.T., a Chinese male, 27 years of age, was first seen on October 31, 1932. The patient stated that 7 days previously he had suffered from a toothache in the right lower

[1] The term suppurative osteomyelitis as used here applies only to those cases which are characterized by more or less extensive necrosis of the body or the ramus of the mandible. This condition should be differentiated from the localized infection of bone (osteitis) associated with an acute dento-alveolar abscess. In a dento-alveolar abscess the destruction of bone is confined to the periapical region, and the establishment of early drainage and extraction of the involved tooth usually serve to arrest the process. Occasionally, as a result of local extension of an abscess of this type, small sequestra limited to the periapical bone are formed; but such lesions should not be included under the term „suppurative osteomyelitis" unless secondary involvement in the body of the jaw-bone can be demonstrated.

Fig. 1. Schematic drawing of the mandible to illustrate points of interest in the surgical anatomy. Except for a small portion in the region of the mental foramen, the outer plate has been removed to expose the medullary bone which extends from the mandibular canal forward to the symphysis mentis. The inferior dental artery, *A*, and its branches are shown.

Fig. 2. Schematic drawing of the operative field after removal of the outer plate from the molar and bicuspid regions (see text).

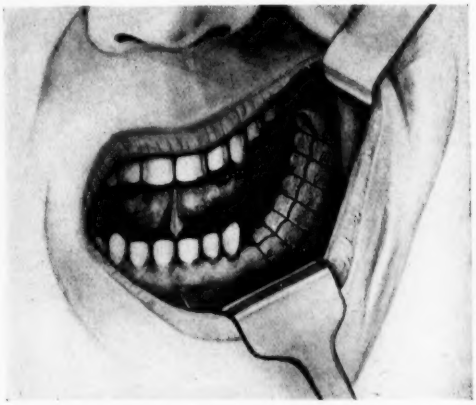

Fig. 3. Schematic illustration showing the gums sutured together. This procedure (second stage of operation) is carried out after the tooth sockets have been exteriorized.

Fig. 4. Pre-operative roentgenogram showing osteomyelitis of the outer plate of the ramus and of the body of the mandible as far forward as the canine tooth (Case 3 of Statistical Table).

molar region, and within a few hours a painful swelling had developed in the right submaxillary and parotid regions. Entrance examination showed essentially normal findings except for the surgical condition. The right side of the face was swollen greatly and there was definite hypo-æsthesia of the right lower lip in the distribution of the mental nerve. There was no definite fluctuation of the external swelling. Intra-oral examination was difficult because of marked trismus. There was definite redness and tenderness around the region of the right lower third molar tooth. Pus flowed from the gum margins of the molar and premolar teeth. The soft palate and the anterior pillar of the tonsil on the right side were inflamed. On the following day the patient was admitted to the hospital. The patient's temperature was 39 degrees C. Examination of the blood showed 4,410,000 red cells, 96 per cent hæmoglobin (Sahli), and 18,150 white blood cells with 87 per cent polymorphonuclear leucocytes. The urine contained a trace of albumin, a few white blood cells, and a few granular casts. The Wassermann and Kahn blood tests were definitely positive. Cultures of pus taken from the intra-oral sinuses showed hæmolytic streptococcus. Blood cultures showed no growth. Examination of the stool showed ova of ascaris. The diagnosis, acute osteomyelitis of the right mandible secondary to alveolar abscess of the right lower third molar tooth, was confirmed by roentgenograms.

On November 2, 1932, a radical operation was performed under nerve block anæsthesia. An incision was made from the lower margin of the parotid gland down to the angle of the jaw, and was extended forward along the inferior margin of the mandible for about 1.5 inches. Subperiosteal dissection allowed exposure of the facial plate of the bone in this region. By means of a hand drill, a small hole was made into the bone at the region of the apex of the impacted third molar tooth. Foul smelling yellow pus escaped from the drill hole. By means of a rongeur this hole was enlarged so that it was approximately 1.5 centimeters long and 1 centimeter wide. The mandibular canal in this region was found to be filled with pus. The wound was left wide open and was packed loosely with vaseline gauze over which dry dressings were applied. Next, the mouth was held open by means of a retractor and the right lower molar and pre-

Fig. 5 A.

Fig. 5 B.

Fig. 5. A, Pre-operative roentgenogram of mandible (Case 6 of Statistical Table) showing osteomyelitis in the molar and premolar regions. Note the pathologic fracture in the premolar area. B, Roentgenogram of the mandible (3 months after operation) of the same case. Note that the osteomyelitis and the fracture are healed.

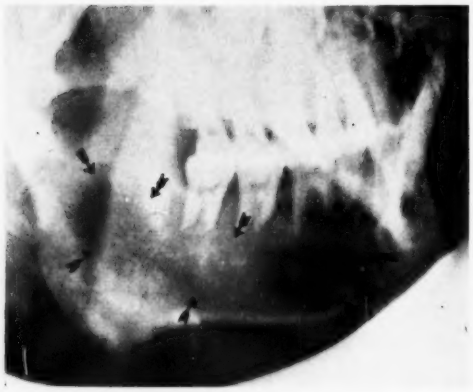

Fig. 6 A.

Fig. 6 B.

Fig. 6. A, Pre-operative roentgenogram of mandible (Case 1 of Statistical Table) showing extensive osteomyelitis of the outer plate of the ramus and body of the mandible. B, Roentgenogram of mandible (3 months after operation) of the same case as shown in Figure 6A, showing healed osteomyelitis.

molar teeth were extracted. The alveolar process was removed so as to allow a direct communication between the tooth sockets and the external wound. Then the gum margins were sutured together.

The patient failed to show improvement following the operation. Two days later he became delirious. There was marked swelling of the right side of the face and neck, and slight exophthalmos of the right eye with definite lagging of its motions. Repeated blood transfusions failed to bring about improvement. (Cultures of blood taken following the operation showed non-hæmolytic streptococcus.) The white blood cell count increased gradually. The local swelling increased and there were definite signs of cavernous sinus thrombosis. The patient died on November 11.

Fig. 7. Photograph (Case 2 of Statistical Table) to illustrate the type of scar which follows the operative treatment presented in this paper.

TREATMENT IN THE RECENT SERIES

All recent cases of acute and chronic osteomyelitis of the mandible were given special study, which led to the formulation of the following plan of management. The method in its entirety has been used only on patients over 14 years of age.

Treatment during the acute stage. Except for the treatment of the teeth, the method of management adopted for the acute stage of the infection was essentially the same as that used in the former series. It consisted of early drainage of the abscess at the point of greatest swelling or fluctuation. The location and path of dissection made by the abscess determined whether the incisions were made on the inside of the mouth or on the outside. In 1 case the pus broke through the bone and formed a sinus on the lingual plate of the mandible. This was uncommon because in most other cases the pus broke through the lateral plate and formed subperiosteal abscesses which pointed in the gums just lateral to the affected teeth or externally along the lower border of the body of the mandible. In cases in which chiefly the ramus was involved, the abscesses were deeply seated beneath the masseter muscle, and produced marked swelling of the parotid region. To drain abscesses of the latter type, incisions were usually made along the posterior border of the ramus. Care was taken not to injure the parotid gland and facial nerve. Following incision of the abscess, vaseline gauze drains were used, and hot compresses were applied.

The treatment of the affected teeth varied in different cases. In most instances there was extreme loosening of the molar and bicuspid teeth over the area of osteomyelitis. The loosening was due to an associated suppurative periodontitis and to an early necrosis and softening of the alveolar process. At this time (between 14 and 21 days after the onset), the teeth which were greatly loosened and bathed in pus were extracted. Other less affected teeth were allowed to remain in position.

In most instances the acute reaction subsided after 10 days or 2 weeks of conservative treatment. The gradual increase of the patient's resistance and the decrease of the virulence of the infection were evidenced by a steady lowering of the temperature together with signs of lessening of the local inflammation. When drainage was maintained adequately during the subacute stage (10 to 21 days), the patients showed progressive improvement. After 21 days the period of infection was designated "early chronic stage." Stereoscopic roentgenograms taken at the second or third week usually showed signs such as mottling, decreased density, and haziness in the bone.

Treatment during the chronic stage. The plan of operative treatment during the early and late chronic stages differed from former methods by including the following steps—especially, steps 3, 4, and 5:

1. An adequate external incision was made along the lower border of the mandible. To expose the posterior portion of the body, the insertion of the masseter muscle was severed and the muscle was retracted laterally (Fig. 2). When exposure of the ramus was necessary, the incision was extended upward along the posterior border. By careful dissection the sheath of the parotid gland was separated from the fascia of the masseter muscle and the inferior portion of the gland was retracted posteriorly. Care was taken to avoid injury to the branches of the facial nerve.

2. Subperiosteal dissection was made carefully to allow exposure *of only the involved area* of the facial plate without needless stripping of the periosteum. Usually it was noted at the time of operation that the abscess had caused an elevation of the periosteum over the most involved area of the facial plate. When the abscess cavity was opened, necrotic cortical bone was seen.

3. As soon as possible after the acute stage (after 21 days from the time of onset), the necrotic portion of the facial plate was removed regardless of whether or not it had separated definitely in the form of a sequestrum. Care was taken not to injure the mandibular nerve and artery. Pieces of uninvolved bone overhanging the necrotic area also were removed carefully, avoiding unnecessary trauma to the soft tissue and bone. Usually the involved bone was removed by means of a rongeur. The use of the mallet and chisel was avoided whenever possible.

4. The external wound was left wide open and was packed loosely with vaseline gauze over which dry dressings were applied. Experience in the treatment of osteomyelitis has shown that partial closure of the wound usually prevents free drainage and thereby favors prolongation and direct extension of the disease.

5. With the mouth held open by means of a retractor, the remaining teeth which were loose and bathed in pus were extracted. The alveolar process on the facial wall was removed by means of a rongeur. This produced a free and direct communication between the infected tooth sockets and the external wound. Occasionally, also, the uppermost portions of the alveolar process were removed from the lingual plate. Thus, after the tooth sockets were exteriorized the gum margins were sewed together directly over them so as to prevent further drainage of pus into the mouth, and seepage of mouth secretion down to the bone. Sinuses existing in the sockets of teeth previously extracted or in their immediate neighborhood were closed in the same way. During the operative procedure, a suction tube was placed behind the tongue to prevent aspiration of the purulent material.

6. The usual methods of immobilization of the mandible were used. In some cases, half-round German silver bars were bent to fit the labial arch of the teeth. Before operation, these bars were wired to the upper and lower arches; and after operation, the jaws were approximated and the bars were connected together by means of brass wires. In other cases wire loops were applied to the teeth as in the standard method used for fracture of the mandible. In 1 case silver cap splints were cemented on the upper and lower teeth of the unaffected side, and these were locked together after operation.

Postoperative treatment. Whenever possible, *immobilization* was continued for periods varying from 2 weeks to 2 or even 3 months; the duration of these periods depended upon the rapidity of healing and the presence or absence of pathological fracture. *Oral cleanliness* was maintained as well as possible by the use of frequent irrigations of the mouth cavity; washing of the mouth by the patient was contra-indicated because the bellows motion of the cheek would have disturbed the line of sutures in the gums. Liquids and

pureed food were fed to the patient through a small tube or a catheter. The dressing in the external wound was allowed to remain intact for a period varying from 2 or 3 days to a week or more. As in the Orr treatment of osteomyelitis of other bones of the body, the frequency of change of dressings was determined by the amount of discharge from the wound. During the first 2 or 3 dressings, only the external gauze was changed—the vaseline gauze was left undisturbed within the external wound. After a week or two the vaseline pack was removed and a new one was inserted; also, the stitches in the gums were removed.

In order to emphasize the points of interest in the surgical management of these cases, the following records have been selected for detailed report.

Complete removal of necrotic bone 29 days after onset. Osteomyelitis cured 2 months after operation.

CASE 1. A Chinese male, aged 33 years, was first seen on April 4, 1933. The entrance complaint was pain in the right lower jaw. Three weeks previously, the patient had suffered from a toothache which was followed 10 days later by swelling and drainage of pus into the mouth.

The general physical examination showed essentially normal findings. Local examination showed swelling and fluctuation near the angle of the lower jaw on the right side. The gums around the loosened bicuspid and molar teeth were swollen. There was considerable purulent discharge from the gums adjacent to the right lower first molar. There was definite hypo-æsthesia of the area supplied by the mental nerve on the right side. Because of marked trismus the patient was able to separate the incisor teeth only one-fourth of the normal distance. The patient's temperature was 39 degrees C. Examination of the blood showed a white blood cell count of 11,900. Roentgenograms showed suggestive evidence of early acute osteomyelitis of the lower portion of the ramus and of the body of the mandible beneath the right molar teeth. On April 7, 1933, an external incision was made over the lower border of the mandible. The subperiosteal abscess was opened and about 55 cubic centimeters of foul smelling green pus was evacuated. Then, the mouth was opened and the right lower bicuspid and molar teeth, which were loosened, were extracted. Iodoform gauze drains were placed in the sockets of the teeth. Conservative treatment, consisting of hot dressings and oral hygiene, was used. On April 15, the lower jaw was prepared for immobilization by the application of wire loops to the teeth.

On April 18, 1933 (25 days after onset of osteomyelitis), a major operation was performed under ether anæsthesia. A curved incision was made from a point just below the lobe of the ear to the angle of the jaw, and was continued forward along the lower border of the mandible to within 2 centimeters of the symphysis mentis. The incision was carried through the platysma muscle, exposing the body of the bone. The facial plate of the bone from the angle of the jaw to the external oblique ridge was necrotic; consequently it was removed. The outer plate of the ramus was of normal color and consistency, and bled freely; therefore, it was left intact. The lingual plate of the bone was intact. Strips of vaseline gauze were packed loosely into the wound. The mouth was opened and sponges were placed in the posterior part of the oral cavity to prevent the pus from flowing into the pharynx. The tissues overlying the alveolus were retracted laterally and medially, and the bone was examined carefully. The alveolar process was firm but its edges were rough. The lateral alveolar margin was trimmed, by means of a rongeur, until a free communication existed between the tooth sockets and the external wound. The gum tissues were approximated with interrupted chromic catgut sutures, thus closing off the mouth cavity from the infected area. The patient reacted normally during the operation and was returned to the ward in good condition. The jaws were wired together after the patient had recovered from the effects of the anæsthetic.

There was no drainage of pus inside of the mouth after the radical operation. The external wound was dressed at weekly intervals with vaseline gauze over which dry dressings were applied. Two months after the operation it had healed completely. The resultant function and occlusion was excellent. There was no pain and no discomfort except that which was the result of persistent numbness in the distribution of the mental nerve. Clinical and roentgenological findings indicated that the osteomyelitis was healed. Further examinations confirmed the latter findings. The last examination was made 6 months after operation, and at that time the numbness in the skin supplied by the mental nerve had disappeared.

In this case drainage of pus into the mouth was prevented by the procedure described in the new plan of management. It was believed that early drainage and extraction of the teeth prevented further involvement by direct extension.

Complete removal of necrotic bone 33 days after onset. Immobilization of jaw for 3 months. Pathological fracture healed 3 months after operation. Osteomyelitis healed 4 months after operation.

CASE 2. A Chinese male, aged 27 years, was first seen on October 1, 1932. The patient stated that 12 days previously he had suffered from a toothache with swelling of the right side of the face. The general physical examination showed essentially normal findings except for the surgical condition. There was a large swelling in the region of the right lower jaw. Intra-oral examination revealed a small draining sinus just lateral to the right lower second molar tooth. Thick yellow pus flowed from this sinus when pressure was applied to the external surface of the jaw. Roentgenograms showed an impacted right lower third molar tooth with irregular areas of destruction of bone around its roots. Trismus was marked. Hot dressings were applied over the jaw, and 2 days later there was considerable increase of drainage from the gums around the second molar tooth. The patient had a temperature of 38.2 degrees C. Examination of the blood showed a white cell count of 13,400. On October 3, 1932, an external incision was made just below the angle of the mandible. About 20 cubic centimeters of thick, yellowish green pus was evacuated. Vaseline gauze drains were inserted. Following this operation, the patient showed a slight rise of temperature. Three days later the right lower second bicuspid and third molar teeth were extracted. These teeth were loose and were bathed in pus. A large amount of pus flowed from the sockets of these teeth. *Following the extraction of the teeth, the patient's temperature subsided promptly to a level very near normal.* Further exploration of the external wound was made on October 16, and several small sequestra were removed.

On October 21 (33 days after the acute onset), the incision was extended from the angle of the jaw to the symphysis mentis and was continued upward along the posterior border of the ramus. After the bone had been exposed by

subperiosteal dissection, a pathological fracture was found just anterior to the angle of the jaw. Most of the outer plate of the body of the mandible and of the lower portion of the ramus was removed. The lingual plate of the mandible was intact and viable except at the point of pathological fracture in the region of the third molar whence, with a curette, a few necrotic spicules of bone were removed. The external wound was left wide open and was packed loosely with vaseline gauze over which dry dressings were applied. The remainder of the operation was performed inside of the mouth. The outer plate of the alveolus in the molar and premolar region was spongy and roughened; consequently it was removed. Also, bits of softened bone were removed from the alveolar processes on the lingual side. After a direct communication had been established between the infected tooth sockets and the external wound, the gums were sutured together so that all intra-oral drainage was stopped. The jaw was immobilized by means of interdental wires fastened to the unaffected teeth and by an external bandage.

The patient had an uneventful postoperative convalescence. There was no further drainage inside the mouth. The interdental immobilization was continued for 3 months; at the end of that time roentgenograms revealed that the pathological fracture had healed satisfactorily. Within 4 months after operation there was complete healing of the external wound. As in the other cases, the external wound was dressed at weekly intervals by means of vaseline gauze over which dry dressings were applied. The early result was very satisfactory. There was good occlusion and good function of the lower jaw.

Final follow-up examination, 11½ months after operation, showed an excellent result. Roentgenograms taken at that time showed good condensation and reformation of the bone with no evidence of recurrence of infection.

The necrosis involved chiefly the outer plate of the bone from the angle of the jaw to the second bicuspid tooth. Since the lingual plate also was involved (there was a definite pathological fracture without solid involucrum), it was necessary to immobilize the mandible for a period of three months. After that time the pathological fracture had healed solidly with no disturbance of occlusion of the teeth. Within 4 months after operation the external wound had healed completely.

Removal of necrotic bone 3 months after onset. Healing of bone delayed because of attempt to save infected tooth. Osteomyelitis cured 3 months after operation.

CASE 3. A Chinese female, aged 34 years, was first seen on September 30, 1932. The patient stated that 27 days previously she had suffered from a toothache in the left lower molar region. On the seventh day after the onset of the toothache, a painful swelling had developed in the left submaxillary region and left cheek. Entrance examination revealed that all of the left molar and premolar teeth were loose. There was a purulent discharge in the left buccal fold. There was definite numbness in the left mental region. Further examination revealed definite evidence of a subperiosteal abscess on the facial plate of the left side of the mandible. Apparently the abscess was draining quite freely around the affected teeth. Hot magnesium sulphate compresses were prescribed and also Dobell's gargle and mouth wash. A short time later an external incision was made over the abscess. The patient failed to follow advice and did not return until December 9, 1932. At that time roentgenograms showed extensive osteomyelitis of the central portion of the body of the mandible with a pathological fracture in the bicuspid region.

The patient was admitted for treatment on December 14, 1932. The temperature was normal, but the white blood cell count was 11,500. General physical examination revealed essentially normal findings. On December 14, 1932 (approximately 3 months after the acute onset), a major operation was performed under nerve block anæsthesia. An external incision was made along the lower border of the mandible. The body of the bone was exposed by subperiosteal dissection. By means of a rongeur the facial plate of the mandible was easily removed from the region extending from the angle of the jaw to the mental foramen. Strips of vaseline gauze were placed in the cavity and dry dressings were placed over them.

Then, with the mouth held open, the 2 left lower bicuspid and 2 molar teeth and the roots of the third molar were lifted out of their sockets. After the gums had been stripped free, the alveolar process was found to be entirely separated in the form of a sequestrum 5 centimeters long and 1 centimeter wide. There was free dependent drainage of the remaining parts of the tooth sockets; hence the gum margins were approximated over them with interrupted silk sutures, thus stopping all drainage into the mouth cavity. There was a definite false point of motion in the involucrum in the premolar region.

Following the operation, the jaw was immobilized by means of interdental wires and splints. The patient was very unco-operative and insisted on the removal of the wires 2 weeks later. According to clinical signs, the pathological fracture was healed approximately 1 month after operation. The external drainage was satisfactory, and the patient was comfortable. Following the closure of the oral sinuses, a very small amount of drainage persisted around the gum margins of the left canine tooth. When the patient was re-admitted 2 months later, this tooth was extracted, its alveolar process was removed by means of a rongeur, and its gum margins were sutured together by means of fine silk threads. In addition, the small external wound was enlarged, and the remaining infection in the bone around the apex of the socket was exteriorized and allowed to drain through the outside wound. The external wound healed completely four weeks after the second operation. The final result was excellent. The function of the jaw was very satisfactory. Occlusion was good. The final follow-up examination was made 6 months after the patient was operated upon.

In this case the osteomyelitis involved chiefly the facial plate with only a minor amount of necrosis of the lingual plate. The major operation was performed approximately 3 months after the acute onset. In spite of infection of the bone at its root and alveolus, the left canine tooth was left intact at the first operation. It was hoped that new bone would form around its roots so that eventually it might be saved. The persistence of the drainage from around the alveolar process necessitated its extraction so as to clear up the remaining focus of infection. In a final analysis of this case, it was believed that all infection of the bone and soft tissue would have been healed in from 6 to 8 weeks provided that, at the major operation, the left lower canine tooth had been extracted and the partially necrotic bone removed from around its apex. Because this was

not done, final healing of the osteomyelitis was delayed until 3 months after the major operation.

Complete removal of necrotic bone 19 weeks after onset of osteomyelitis. Osteomyelitis healed 9 weeks after operation. Pathological fractures healed 12 weeks after operation.

CASE 4. A Chinese boy, aged 15 years, was first seen on February 9, 1933. The patient stated that 4½ months previously he had suffered from a toothache in the right lower molar region. Several days later, a swelling had involved the entire right side of the face and purulent material had drained inside of the mouth. Three months prior to admission, the swelling had ruptured externally at two places near the angle of the jaw. At the time of admission there was drainage of pus from sinuses on the inside and on the outside of the mouth.

The boy was somewhat underdeveloped but quite well nourished and not acutely ill. He showed a slight fever (37.6 degrees C.). Microscopic examination of the blood showed a white cell count of 12,000. The gums in the right lower molar region were reddened and swollen, and there was considerable purulent discharge from the region of the right lower second molar tooth. The whole right side of the face was swollen and indurated. There were two sinuses discharging externally in the submaxillary region. The sinus tracts led to the bone. Roentgenograms showed definite evidence of extensive osteomyelitis of the body and ramus of the right half of the mandible. Interdental splints were made and wired to the uninvolved teeth of both jaws. (These splints were not fixed together, however, until after operation.)

On February 17, 1933, the patient was operated upon under ether anæsthesia. An incision was made along the inferior border of the mandible from the symphysis mentis backward to the angle and then upward along the posterior border of the masseter muscle. Necrosis was seen in the ramus and body of the mandible from the mandibular to the mental foramina. In the region where the facial artery crossed the body of the mandible there was a plate of involucrum about 2 centimeters wide and 3 millimeters thick. All necrotic bone was removed. There was a well formed, but not absolutely solid, involucrum along the entire inner periosteal surface of the large sequestrum. There were two false points of motion (pathological fractures) in this involucrum, one at the angle of the jaw and another about 3 centimeters lateral to the symphysis mentis. It was believed that the involucrum would unite eventually to afford stability for that side of the lower jaw. The wound was left wide open and the cavity was packed loosely with strips of vaseline gauze, over which dry dressings were applied.

With the mouth held open by means of a retractor, the right lower molar and premolar teeth were extracted and their alveolar processes were trimmed. There was a free communication between the deeper portions of the sockets of these teeth and the external wound, hence the gum margins were sewed together over them, by means of catgut sutures.

The patient had an uneventful postoperative convalescence. His temperature and white blood cell count returned to normal quite promptly. Five days after operation, the external dressings and vaseline pack were removed, and new vaseline dressings were applied and bandaged into place. Because of the presence of two points of non-union, the jaw was immobilized for 3 months after operation. During that time dressings were reapplied approximately at weekly intervals. There was no drainage inside the mouth at any time after operation. The external wound filled with granulations rapidly and was healed completely 2¼ months after operation. Three months after operation roentgenograms showed a fair amount of new bone in the regions of non-union; consequently the wires and splints were removed from the teeth, and exercises for mobilization of the mandible were started. On removal of the wires the occlusion was very satisfactory and within a few days the function of the lower jaw was excellent. The patient was last seen on October 6, 1933 (8 months after admission). He was advised to return at a later date for a plastic operation upon the cheek (removal of the scar at the lower border of the mandible).

In this case the operation was performed 4¾ months after the onset of the disease. In spite of the pathological fracture—the involucrum was not yet solid—all necrotic bone was removed. By means of interdental wires the mandible was immobilized for 3 months; at the end of that time the two areas of non-union had become solid. There was no purulent drainage into the mouth after the operation.

EVALUATION

In the cases presented, the osteomyelitis was of odontogenous origin, and the commonest source of infection was from impacted third molar teeth. It should be emphasized again that the method of treatment described in this paper was used only on patients over 14 years of age.[1]

The question of retaining or removing loose teeth was one that caused much controversy, and the treatment was varied in different cases. In all of our cases the outer plate of the body of the mandible and of the alveolus was involved in a necrotizing process and the periodontal membranes of the molar and bicuspid teeth showed suppurative inflammation. *The teeth involved most severely were always found to be very loose and bathed in pus; and they were removed only when these conditions were present.* In 3 cases extractions were performed within 21 days after the onset of the disease with the hope of relieving the tension of the inflammatory products in the body of the bone itself. Removal of the teeth was followed by welling up of pus from the sockets. It was interesting to note that in Case 2, following external incision and drainage of the abscess, the temperature remained elevated, but that it subsided promptly after the removal of the molar and bicuspid teeth. (Sections taken from pulp tissues of teeth removed from each of the cases in this series showed extensive necrosis.)

Other teeth which were involved extensively and loosened by infection were removed at the time of the unroofing operation. Certain of the teeth removed at that later date might have survived the infection (Wassmund, Hesse, Frey)

[1] The treatment of suppurative osteomyelitis of the mandible in children presents certain different problems, which will be dealt with in a separate communication.

TABULATION OF CASES

No. Age, Sex	Duration before conservative treatment	Extent of osteomyelitis	Treatment			Results
			Acute stage (1–3 weeks)	Duration of osteomyelitis before major operation	Chronic stage (3 or more weeks)	
1 33 M	3 wks.	Outer plate, from angle of jaw to first bicuspid	Abscess incised; 2 teeth extracted	29 days	Outer plate removed. Alveolus trimmed. Gums approximated. Jaw immobilized 3 weeks	Osteomyelitis healed 2 months after operation. Function and occlusion excellent. Follow-up 6 months
2 27 M	12 da.	Outer plate, from mandibular to mental foramina. Pathological fracture below third molar	Abscess incised; 2 teeth extracted	33 days	Outer plate removed. Alveolus trimmed. Gums approximated. Jaw immobilized 3 months	Osteomyelitis and fracture healed 4 months after operation. Function and occlusion excellent. Follow-up 11½ months
3 35 M	15 da.	Outer plate of ramus and body, posterior to second bicuspid	Abscess incised	26 days	Outer plate removed. 3 molar teeth extracted. Alveolus trimmed. Gums approximated. Jaw immobilized 2 weeks	Patient discharged against advice 2 weeks after operation. Gums healed, external drainage good. Condition excellent. Follow-up impossible. (Military evacuation)
4 22 M	2 wks.	Outer plate of body, from angle of jaw to incisor region	Abscess incised; 3 teeth extracted	33 days	Outer plate removed. 3 teeth extracted. Alveolus trimmed. Gums approximated. Jaw immobilized 2 weeks	Patient discharged against advice 9 days after operation. General condition excellent. Follow-up impossible. (Military evacuation)
5 24 F	3 wks.	Infected radicular cyst. Osteomyelitis outside of cyst wall		23 days	Outer plate removed. Bicuspid and canine teeth extracted. Alveolus trimmed. Gums approximated	Osteomyelitis healed 5 months after operation. Function excellent. Follow-up 11 months
6 34 F	20 da.	Outer plate, from angle to mental foramen. Pathological fracture in bicuspid region. Alveolar processes	Abscess incised	3 mo.	Outer plate removed. Molar and bicuspid teeth extracted. Necrotic alveolus removed. Gums approximated. Jaw immobilized 2+ weeks	Fracture and osteomyelitis healed 3 months after operation. Function and occlusion excellent. Follow-up 6 months
7 15 M	4½ mos.	Facial and lingual plates, from mandibular to mental foramina. Two pathological fractures		4¾ mo.	Both necrotic plates removed. Molar and bicuspid teeth extracted. Necrotic bone removed. Alveolus trimmed. Gums approximated. Jaw immobilized 3 months	Osteomyelitis healed 2½ months after operation. Fractures healed 3 months after operation. Function and occlusion excellent. Follow-up 8 months
8 32 M	2 yrs.	Both plates of anterior part of ramus and postero-superior part of body healing. Pathological fracture		2 yrs.	Necrotic bone removed. No extractions. Teeth quite solid. Jaw immobilized 6 weeks	Osteomyelitis and fracture healed 3 months after operation. Function and occlusion excellent. Follow-up 7 months

and become solid, if they had been allowed to remain intact for several months,—but they would have demanded root canal therapy. It is still a debatable point whether or not root canal therapy is ever indicated in multi-rooted teeth. Nevertheless, it was believed that maintenance of those teeth would have delayed healing of the underlying bone (Haupl) and that, since the sockets of the infected teeth could not be drained satisfactorily, removal of the teeth was indicated to prevent development of chronic foci of infection.

It was difficult to determine an exact time for the removal of necrotic bone and the establishment of thorough drainage. In cases of partial necrosis of the mandible, the time varied in individual cases according to the virulence of the infection. In most of the cases in this series, the general and local symptoms began to subside after 10 days, and after 21 days the condition was definitely subacute or chronic; at which time the danger of a major operation was greatly minimized. At operation it was possible, by gross inspection alone, to distinguish the involved from the uninvolved bone. In one case, because the patient failed to return for treatment, the major operation was performed 4¾ months after the onset of the disease, and at that time a fairly solid involucrum had been formed by the periosteum of the lingual plate. It was our impression, from experience in the other patients who were operated upon at an earlier stage, that the early operations prevented direct extension of the disease, and thereby prevented extensive necrosis of the lingual plate of the bone. It is our conviction that adequate drainage of the medullary bone of the mandible cannot be obtained through small external openings such as are made during the acute stage, and, therefore, unnecessary delay in the unroofing operation will favor extension of the disease.

In the major operation the wide external incision was chosen for the purpose of obtaining complete dependent drainage. It was our plan to remove all necrotic bone and any portions of the living bone which overhung the necrotic area. Usually the necrosis was present in the facial wall of the ramus or body of the mandible between the mandibular and the mental foramina. The upper portion of the ramus and the facial wall between the mental foramen and the symphysis mentis usually escaped without necrosis. In most instances the bone of the lingual plate showed less necrosis than that of the facial plate.

In 4 of the cases a portion of the lingual plate of the mandible also was necrotic and therefore there were definite pathologic fractures. In 3 of the cases showing pathologic fracture, there was only a narrow transverse area of necrosis of the lingual plate (the facial plates, however, showed extensive necrosis); and, therefore, even though involucrum had not yet formed, it was possible to remove all necrotic bone without danger of displacement of the fragments. In the fourth case, both facial and lingual plates were necrotic from the lateral incisor to the third molar teeth; but, since the major operation had been performed 19 weeks after the onset, involucrum had formed sufficiently to allow complete sequestrectomy to be carried out. The pathologic fractures were treated by immobilization of the lower jaw by means of interdental splints and wires. In these cases, as well as in 2 other cases not included in this report, the fractures healed solidly, in good alinement; and the occlusion of the remaining teeth was satisfactory.

In the future we plan to remove the necrotic facial plate as soon as possible after the subsidence of the acute infection (i.e., 21 or more days after the onset). At that time, if the lingual plate is uninvolved except for a small transverse area of necrosis with pathologic fracture (i.e., a narrow transverse area of necrosis extending from the alveolar process to the inferior border of the bone) the method as described shall be carried out in detail. On the other hand, if massive involvement of the lingual plate is encountered after removal of the necrotic facial plate, the lingual plate shall be left intact in order to preserve the shape of the jaw during the time when involucrum is forming in the inner layer of the periosteum. If the involved portion of the lingual plate undergoes complete necrosis, it can be removed by a second operation at a later date (after 3 or 6 months).

In the cases of suppurative osteomyelitis of the mandible (old series) treated by previous methods, draining sinuses within the mouth were usually present. These sinuses were the result of incisions, extraction of teeth, or spontaneous drainage around the sides of the affected teeth. It is impossible to estimate the ill effects resulting from the ingestion of the pus over a period of many months. We believe that the osteomyelitis was prolonged by reinfection with mouth organisms,—a direct result of the communications between the oral cavity and the bone. Even though this danger may be more apparent than real, it seems advisable to eliminate it whenever possible. From the standpoint of the patient, drainage of pus into the mouth is one of the most undesirable features of the disease. For these reasons and, also, to shorten the period of healing of the bone, the sinuses leading into the oral cavity were closed. No severe post-operative reactions or complications followed this procedure.

During the healed stage the only complaints were of slight tenderness of the operative scar, in 3 cases. The patients noted the discomfort only while lying with that side of the face against a pillow. Plastic operations were advised for the purpose of removing the scar.

The method described in this paper follows certain of the basic principles which have been emphasized by H. Winnett Orr for the treatment of osteomyelitis of long bones. These principles of management include: (1) wide incision; (2) unroofing of bone; (3) leaving the wound wide open; (4) vaseline gauze dressings; and (5) immobilization of the part. In applying these principles to osteomyelitis of the mandible, it was necessary to modify many of the details of technique. These details have been outlined in the preceding paragraphs. The Orr principle of noninterference with the wound was not followed, chiefly because of the great amount of drainage which necessitated frequent change of dressings. In all of the cases in our recent series the bone healed promptly, and the wound reacted just as it does ordinarily after operations for osteomyelitis of the long bones. Following the unroofing operation, there was no extension of infection into the uninvolved bone. Wide incision and complete exteriorization of the infected area were the factors responsible for the prevention of this dreaded complication.

SUMMARY

1. A review and a discussion of the surgical treatment of osteomyelitis of the mandible is presented.

2. A method of management for the chronic stage is described. The method embodies the following steps:

a. Removal of the necrotic outer plate of the mandible as soon as possible during the early chronic stage (i.e., 21 days after the onset). The necrotic bone is removed through a wide external approach and may be excised before it has separated spontaneously in the form of a sequestrum. In case of massive necrosis of both plates of the mandible sequestrectomy is delayed until involucrum has formed.

b. Removal of teeth over the area of osteomyelitis. These teeth are always loose and bathed in pus, and in most instances their pulp tissue is necrotic.

c. Exteriorization of the tooth sockets and partial resection of the alveolar process with complete closure of the gum margins to prevent further drainage of purulent material into the oral cavity.

d. Immobilization of the jaw.

3. The results of 8 cases treated successfully by the new method of management are presented. The results have been very encouraging and, we believe, superior to those obtained by the more conservative treatment.

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AN EXPLANATION OF PROLONGED LABOR IN CASES OF OCCIPITOPOSTERIOR POSITION

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THE opinions of obstetricians concerning the significance of occipitoposterior positions are generally not in accord. Several European authors, for instance, attach no special importance to this condition, because, according to their experience it does not, as a rule, seriously interfere with labor. Other writers, notably American, however, consider the management of occipitoposterior position during labor a task of great responsibility and one requiring active treatment. The latter view is held for the most part by those obstetricians who display a tendency toward interference and prefer to terminate labor when dilatation of the cervix is complete. They will observe the condition frequently because they will encounter occipitoposterior positions in cases in which anterior rotation of the small fontanelle would have occurred spontaneously after a lapse of time.

In my opinion, the high incidence of 30 per cent of occipitoposterior positions during labor reported by Bill are possibly to be explained thus.

In contradistinction to the overestimation of the importance of occipitoposterior position, there are obstetricians who consider that this position exerts no effect on the course of labor. This view is obviously erroneous. I am entirely in accord with the views of Bland and DeLee regarding the significance of occipitoposterior positions in labor.

In my experience, the great majority of cases of labor with posterior occipital positions terminate spontaneously, although some delay is to be expected. Occasionally, however, considerable difficulty arises which requires interference.

Though several authors mention that occipitoposterior position causes decided prolongation of labor (Bill, Bland, Danforth, DeLee, and Williams), I must emphasize that in my experience it is mainly the *first stage* which is lengthened. According to Jaschke, the second stage is the one essentially prolonged. Prolongation of the second stage, however, is not significant in itself since it results either from exhaustion of the uterine musculature produced by an extended first stage or from the non-engagement or tardy descent of the occiput into the pelvic cavity.

Attention should here be directed to these two complications, requiring careful consideration, namely, prolongation of the first stage and tardy descent of the head. In my series of cases these complications occurred in 20 to 25 per cent of occipitoposterior labors. All of us can recall cases in which the head is floating, the membranes are ruptured, and dilatation of the cervix is progressing slowly. Occasionally, labor comes to a standstill in these cases. If at this point vaginal examination is made, the small fontanelle will be found in many cases in the posterior quadrant of the pelvis. If the obstetrician, however, does not appreciate the delay in labor or fails to attach any special significance to it, and postpones vaginal examination, he will be unable to diagnose the condition later because of the development of a large caput succedaneum. Yet the posterior rotation of the presenting part may be the sole cause of the delay.

I have been unable to find in the available literature any explanation of the lack of proper descent of the head into the pelvic cavity in certain cases. I have, therefore, sought its explanation since it cannot be attributed entirely either to primary inertia or to ineffective uterine contractions.

It is well known that the anterior wall of the bony pelvis (the os pubis) is much lower than the posterior wall formed by the hollow of the sacrum. As the head traverses the pelvis in the direction of the so called pelvic axis, all points of the presenting part do not advance an equal distance. The part nearer the pubic arch reaches the outlet sooner than that approaching the sacrum. The situation resembles the bend in a circular race course where the competitor on the inner side has a shorter distance to travel. In occipito-anterior positions the small fontanelle is in the anterior part of the pelvis and after a descent of only a few centimeters reaches a point deep in the pelvic inlet (Fig. 1). On the contrary, if the small fontanelle is in the posterior section of the pelvis (occipitoposterior position) the head will not have engaged in the inlet after traversing the same distance (Fig. 2). Obviously, if the small fontanelle is in the posterior quadrant of the pelvis the course of labor will be more difficult. The difficulty will be relatively insignificant if uterine action is vigorous or if the head is small in comparison with the pelvic diameters.

This is verified by the experience of most authors. Jaschke for example mentions that occipitoposterior position "fortunately occurs almost exclusively with small dead or premature fetuses."

In this way it can be explained why in certain cases of occipitoposterior position the head fails to descend into the pelvic canal or its descent is delayed. My explanation applies solely to the progress of labor in occipitoposterior position, and does not touch upon the theories concerning the mechanical factors of the etiology of this anomaly (Sellheim, Mueller, Zweifel, Kehrer, Lahm, Porter, Fekete).

The question arises, what should be the procedure in cases in which the small fontanelle is in the posterior half of the pelvis and descent into the pelvic cavity is retarded. It need not be emphasized that the only correct attitude is that of careful observation since in the majority of cases spontaneous delivery ultimately occurs. I am, therefore, opposed to the view of surgical intervention when the cervix is fully dilated. Such a procedure would cost many maternal and still more fetal lives.

However, if the labor is definitely delayed and the small fontanelle is located in the posterior quadrant of the pelvis, in the absence of other abnormalities (disproportion, inertia, etc.), anterior rotation of the occiput should be aided by other means. At the onset of labor, a change of posture such as knee-chest or lateral-recumbent position may be of advantage. At the completion of the first stage, anterior rotation of the head should be effected by manual rotation. This procedure has proved efficacious especially in multiparæ in my personal cases, as well as in those reported by Bland. Manual rotation is often followed by rapid descent of the head into the pelvic cavity.

It should be stressed here that it is not necessary to rotate the occiput until it reaches the anterior termination of the oblique diameter. It is often observed that after a slight manual movement the occiput rotates spontaneously during the next few pains.

Of course, it is to be expected that in a proportion of cases, labor will require termination by forceps. It is not my purpose here to deal with this type of case, but merely to present the explanation of the mechanism of labor and to point to its practical application. I should like to mention that if the head is in or near the outlet and termination of labor is indicated because of maternal or fetal reasons, forward rotation of the small fontanelle with the Kielland forceps should be attempted. This should not be forced, and if it is easier, the head should be delivered in the occipitoposterior position.

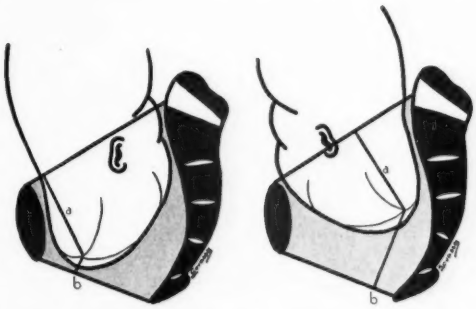

Fig. 1, left. Occipito-anterior position.
Fig. 2. Occipitoposterior position. Explanation: *a*, The distance of the point of direction from the inlet in both cases equal. *b*, The distance of the point of direction from the outlet on Figure 2 considerably longer.

One point which merits brief consideration is the question of vaginal examination. One should not hesitate to employ it when the necessity of correct diagnosis is at hand. Although needless vaginal examinations may court disaster, omission of it is likewise fraught with danger when it is necessary to obtain a clear picture of the situation. Though vaginal examination is regarded as an operation on account of inherent dangers, in certain cases performance of it is imperative. Internal examination performed with skill and strict adherence to the rules of sterility (preparation of patient, scrubbing of hands, sterile rubber gloves) will make possible early recognition of certain anomalies (moderate disproportion, occipitoposterior position, etc.), without danger to the parturient patient. Bearing these in mind, the obstetrician will attend the case with special care, and in this way many children may be saved who otherwise would have died as victims of excessive conservatism.

EDITORIALS

SURGERY, GYNECOLOGY AND OBSTETRICS

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AUGUST, 1934

CARL ARTHUR HEDBLOM

CARL ARTHUR HEDBLOM, professor of surgery at the University of Illinois College of Medicine, and for many years a member of the editorial staff of the International Abstract of Surgery, died suddenly, after an illness of less than forty-eight hours, while attending the meeting of the American Surgical Association, in Toronto, June 6, 1934. His untimely going is mourned by a devoted wife, by three sons and a daughter, by a mother now in her ninety-second year, by a brother and six sisters, and no less by his colleagues in the surgical profession both in America and abroad, by his associates in the College of Medicine, and by a host of grateful patients in the many centers to which his varied and active career carried him.

Dr. Hedblom, one of the youngest of eight children, was born of Swedish parents in Dayton, Iowa, March 5, 1879. In spite of lack of encouragement, and even opposition on the part of his parents, he determined to follow the practice of medicine. After receiving the degree of bachelor of arts from Colorado College in 1907, he entered Harvard Medical School and was graduated in 1911. Just before the close of his two years' service as interne and resident at the Massachusetts General Hospital he was married to Eleanor Pease. Shortly afterward he received the appointment of professor of surgery in the Harvard Medical School of China at Shanghai. There, as throughout his life, work seemed to crowd upon him; and the demands of a rapidly increasing private practice together with the work of the department of surgery of the medical school seemed almost too great even for his abundant energy.

In 1916, he returned to America and became first a fellow in surgery at the Mayo Clinic, and soon afterward an active member of the surgical staff. From 1919 to 1924 he was head of a section on general surgery, and of the department of thoracic surgery at the Mayo Clinic. His thesis on chronic empyema, published in the *Annals of Surgery* in September, 1920, and based on the studies in recognition of which he was awarded the degree of doctor of philosophy by the Mayo Foundation of the University of Minnesota, is the most scholarly and comprehensive presentation of that subject in American surgical literature.

In 1924, he left the Mayo Clinic to become professor of surgery at the University of Wisconsin Medical School at Madison; and two years later was appointed professor of surgery at the University of Illinois College of Medicine. In Chicago he gathered about him a group of earnest young men at the new Research and Educational Hospital and there began to build up a department of surgery upon a sound foundation of serious surgical research, clinical teaching and investigation,

and careful treatment of an ever increasing number of surgical patients.

In 1930, while operating upon a patient with a virulent infection of the pleural cavity he sustained a small penetrating wound of the right index finger, which went on to a rapidly spreading septicæmia. Although this serious illness incapacitated him for a number of months, he was never heard to voice a word of complaint, and eventually he returned to his surgical work without any apparent loss of skill or dexterity in spite of the considerable loss of function of the affected finger.

U. & U.

CARL ARTHUR HEDBLOM
1879–1934

In 1932, with his wife and children, he made a tour of the Scandinavian countries and visited many of the surgical clinics of northern Europe. He often referred to this experience as one of the happiest of his life; and he undoubtedly proved a messenger of good will and stimulated the interest of his Scandinavian colleagues in American surgery, for scarcely a month seemed to pass thereafter without some distinguished surgeon from Denmark, Norway, or Sweden making his appearance in Chicago and visiting its schools and hospitals under Dr. Hedblom's guidance.

His last appearance before his colleagues in Chicago was at a meeting of the Chicago Surgical Society, May 4, 1934, when he presented a paper upon "Tumors of the Thorax." It might well have been a valedictory of his life's work, for it told in a clear and concise fashion the possibilities, the scope, the limitations, and the results of thoracic surgery as a competent and skillful thoracic surgeon visualized them.

While preparing his last paper, on "The Results of Extrapleural Thoracoplasty in the Treatment of Pulmonary Tuberculosis," which was presented before the American Association for Thoracic Surgery in Boston, May 31, 1934, he told his wife that after this paper was finished he would take a long and much needed rest. He probably never dreamed how fateful and prophetic these words would come to seem.

Dr. Hedblom's outstanding physical characteristics were a rugged sturdiness of body and a charming friendly smile. They both seemed to reflect the inner qualities of the man —those qualities which endeared him to those who knew him best, and which stood out in his work and in his relations with his associates, his students, and his patients. At the solemn and impressive funeral at the Fourth Presbyterian Church, at which a large and imposing group of friends and fellow physicians gathered to do him honor, the speaker said of him, "Like the Great Physician 'he went about doing good.'" Perhaps there could be no more fitting characterization of his life work, or no more appropriate tribute to the memory of a devoted husband and father, an able surgeon and teacher, and a loyal friend.

SUMNER L. KOCH

TUBERCULOUS EMPYEMA

A SPECIALIST in tuberculosis recently distributed in this country and abroad a questionnaire in which a space of three lines was furnished for the answer to the question, "How do you treat empyema following artificial pneumothorax? Give details." Such a question is illustrative of the widespread lack of appreciation of the many essential differences among tuberculous empyemas and of the complexity of treatment.

It is impossible to prepare a simple formula that can be applied to the treatment of all cases of tuberculous empyema. Attempts to standardize rather than to individualize treatment are chiefly responsible for the present high mortality of the disease. Probably a majority of physicians limit treatment to repeated aspirations of pus and injection of some antiseptic solution, and use closed or open tube drainage only when a prolonged trial of aspiration has failed and the patient is desperately ill. Some surgeons standardize treatment to the extent of promptly using thoracoplasty in practically all types of the disease. Others treat tuberculous empyema just as they would non-tuberculous empyema. In some clinics the form of treatment used depends upon the cellular characteristics of the pleural exudate or upon the severity of the patient's symptoms. It is not surprising that treatment based upon such narrow conceptions of the problem produces appallingly bad results; many sanatorium physicians have never had a complete cure in a case of a mixed tuberculous and pyogenic empyema.

The principal reason for confusion as to the best methods of treatment and for the so common poor results is that tuberculous empyema is usually treated as if it were a simple disease, varying merely in the severity of the infection and in the different manifestations of symptoms. Actually, fundamental differences of type among tuberculous empyemas demand that treatment be highly individualized. Carl Hedblom's classification into four main groups is the only logical one of which I know. Until it is generally adopted and treatment based upon it, management of the disease will continue to remain in chaos.

Groups I and II have no active pulmonary tuberculosis, whereas Groups III and IV have. Groups I and III have pure tuberculous empyema and Groups II and IV have mixed tuberculous and pyogenic empyema. Pure tuberculous empyemas should never be treated by closed or open tube drainage, whereas mixed empyemas usually must be. As the patients of Groups I and II have no active pulmonary tuberculosis, treatment should be directed toward getting the lung to expand and fill the empyema cavity, but the actively tuberculous lungs of Groups III and IV should usually be kept collapsed. Treatment restricted to aspiration or tube drainage or thoracoplasty in all groups is obviously doomed to many failures.

Tube drainage of the pure tuberculous empyemas of Groups I and III inevitably leads to pyogenic infection which is always harmful and not rarely eventually fatal. No matter how toxic the patient and how thick and ugly the aspirated pus, tube drainage should not be used unless pyogenic organisms can be demonstrated in the pus. A toxic patient, however, should not be classed as belonging to Group I or III and denied the benefits of drainage if one or two smears or cultures of aspirated pus are negative for pyogenic organisms; repeated cultures should be made, planting the pus upon several types of media immediately after aspiration. The pus of all tuberculous empyemas should be cultured to determine whether pyogenic organisms are present.

Empyemas of all groups may benefit from temporary or permanent interruption of the

phrenic nerve. In Group I patients aspiration of pus and replacement with a gradually decreasing amount of air should check the formation of pus and cause full expansion of the lung in a high percentage of cases. If this should not occur, an extrapleural thoracoplasty should be performed. In Group III patients the same treatment should be used. Sufficient air, however, should be introduced after each aspiration to keep the actively tuberculous lung collapsed if collapse is indicated. Obliterative pleuritis often causes forced expansion of the lung and loss of the pneumothorax. Oleothorax may be used to prevent this but in the majority of cases with obliterative pleuritis an extrapleural thoracoplasty must be used to maintain pulmonary collapse.

Attempts to kill the pyogenic organisms in Group II cases with repeated aspirations and antiseptic instillations or irrigations should not be persisted in for more than a few days in toxic patients because such efforts usually fail. An encouraging temporary remission in the severity of the symptoms and temporary disappearance of culturable pyogenic organisms are frequently all that is accomplished. Air-tight or open tube drainage should be used, according to the specific indications. Prolonged tube drainage with antiseptic irrigations results in complete expansion of the lung and obliteration of the empyema cavity in some cases of mixed tuberculous empyema. The majority, however, eventually require extrapleural, or extrapleural and Schede, thoracoplasty to close the empyema completely, even if the lung need not be collapsed.

The object of treatment in Group IV is to evacuate the pus, sterilize the cavity, and maintain collapse of the diseased lung. Treatment is virtually the same as for Group II, except that a thoracoplasty should be performed, if not contra-indicated, before drainage results in a harmful degree of expansion of the lung.

The general, briefly outlined plan of treatment is, of course, subject to many necessary modifications because of such special factors as age of the empyema, unusually mild or severe infection, poor condition of patient, hopeless bilateral cavernous pulmonary or other tuberculosis, pleurocutaneous sinus or bronchopleural fistula with or without vomica.

Individualization in applying the available procedures is capable of producing far better results than the routine exclusive use of aspiration or drainage or thoracoplasty. In a group of 70 consecutive tuberculous empyemas, 69 of which had mixed tuberculous and pyogenic infection or active pulmonary tuberculosis, or both, and 17 of which had bronchopleural fistula, 61.4 per cent are cured (solidly closed empyema without sinus, and no tubercle bacilli in the sputum, or no sputum); 32.9 per cent are dead. It is significant that only 2 of the 23 deaths were directly, and only 6 perhaps indirectly, connected with a surgical operation; the other deaths were due chiefly to continuing progression of pulmonary tuberculosis, principally in the contralateral lung. Thoracoplasty was used in 45 of the 70 patients, 80 per cent of whom are cured.

The widespread prejudice among internists against surgery is based first upon the poor results that occur when the patients are not referred for operation until they have become extremely toxic, and second upon the poor results that occur when surgical drainage is not efficient and when extrapleural or Schede thoracoplasty has not been planned to assure complete closure of the empyema cavity.

Attainment of the best results depends chiefly upon recognition of the importance of distinguishing between the four distinct types of the disease and upon a high degree of individualization in applying the various therapeutic measures that may properly be used in each type. JOHN ALEXANDER.

MASTER SURGEONS OF AMERICA

ARTHUR AYER LAW

OVER the last resting place of one of nature's truest gentlemen, one of her brightest, happiest spirits, one among the most brilliant, the most helpful saviors of suffering men and women, stands a headstone which bears the following inscription:

ARTHUR AYER LAW
Soldier—Surgeon
Born April 16, 1872—Died, July 9, 1930

It may be aptly said of Dr. Law that "Whom the gods love, die young." For he was surely one whom the high gods loved. And he was one of whom it was true that his days were foreshortened by the strenuous pressure under which he lived them.

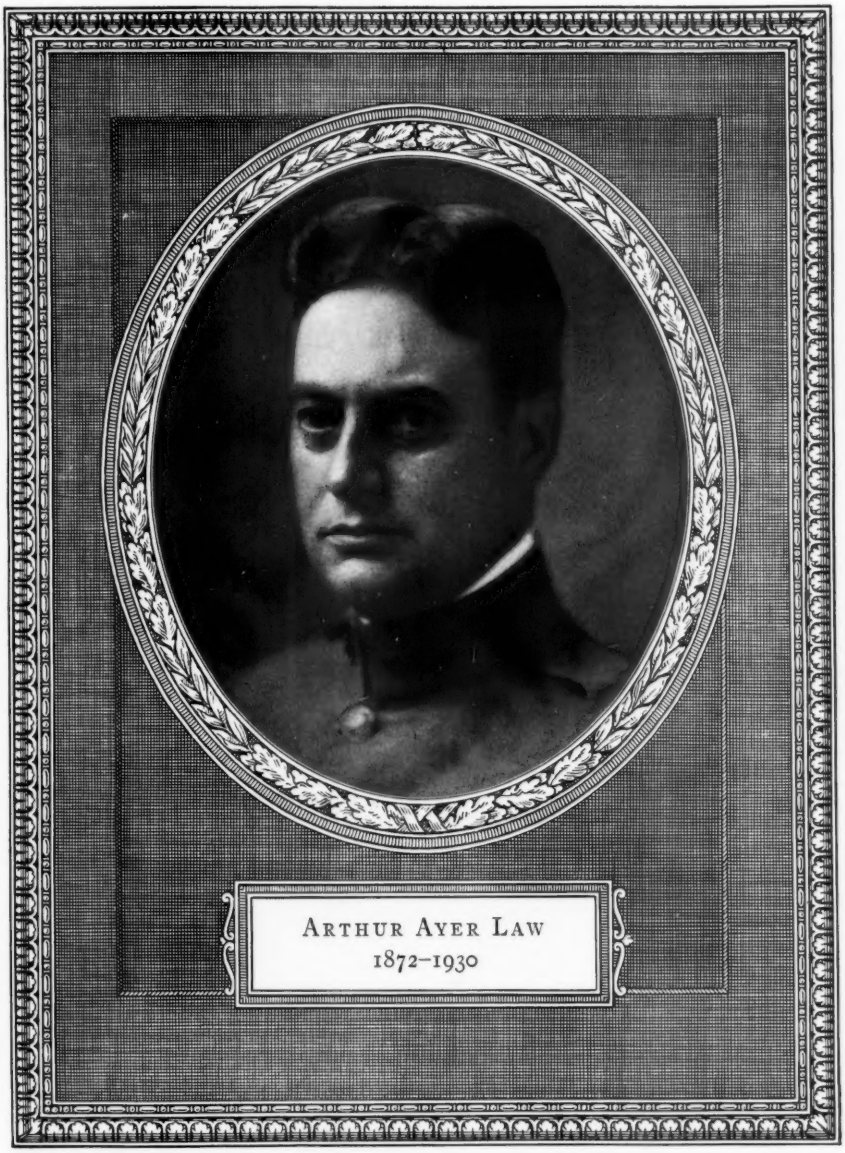
Handsome of feature and of form; consciously upstanding among his fellows; favored of birth, of family and of fortune; he went through life admired of his friends, beautifully devoted to his nearest and dearest lovers; blessing and blessed in his home companionships; keenly alive to the beauties of art, music, and literature; faithful to his professional associates; appreciative of their personal friendship and giving them freely of his own; taking his forward place among them as of right, and according to them theirs, on equal terms.

Had he lived less intensely, he might have lived longer, but he would not have lived in the full enjoyment of life as he did; he would not have been the Arthur Ayer Law that he was.

His creed was written in the glorious lines of William Cullen Bryant, which he loved:

> A mighty hand, from an exhaustless urn,
> Pours forth the never-ending flood of years
> Among the nations,
> Its rushing waves bear all before them,
> On its foremost edge,
> And there *alone* is Life.

He drained that flowing cup of life, forever at the brim. It filled his soul with that elixir of joy—the incomparable joy of living that made his native atmosphere.



ARTHUR AYER LAW
1872–1930

BRIT. OF MUS.

He was a Britisher, not by birth, but by blood, by a long line of English ancestry, by the choice heritage of traits characteristically Celtic. And yet he was a loyal American who translated into the terms of democracy the principles of Runnymede and the pride of his Anglo-Saxon race.

His forbears had served for generations in the army and navy of Great Britain. An uncle, officer in the Royal Welsh Fusileers, had been killed at the Relief of Lucknow, as "the Pipes of Scotland played." Another uncle had died in service in Australia, and a third had gone down fighting in China. His father, Arthur Ellenborough Law, but recently dead, had served for several years as a British midshipman. He came to America aboard the famous clipper ship, *The Flying Cloud*. He settled in Illinois where, at Harvard, this boy of his, Arthur Ayer Law, was born. Railroading by occupation, the father, from his boyhood up, remained a skilled violinist. His music teacher, who played in the old Shakespearean theater in London, now and then allowed his young pupil to play in his place in the orchestra.

Arthur's mother, daughter of the late Judge Eldridge Ayer, a civil war patriot, is still living at over eighty years. She was an accomplished pianist and she recalls how she and his violin-loving father oftentimes put Arthur to sleep to the operatic strains they would play together. Both of them bestowed upon the boy his life-long love of music.

Arthur Ayer Law was especially interested in the history of his paternal grandfather, Henry Law. Born in Glasgow, educated at the University of Edinburgh, Dr. Henry Law subsequently became a Fellow of the Royal College of Surgeons and practiced his profession abroad. Forsaking his surgical work in later life, he owned and directed a line of merchant marines plying between England and the Orient.

With such a heredity and such a family history, it was little strange that Arthur Ayer Law should have begotten a taste for that intensity of living which characterized him in all he did, with that habitual love of adventure, and with his actual propensity for war and the discipline of war which he carried into all his years. He was an exemplar of the hereditive theorem of Hergesheimer: "That I am,—that I was before I was born."

It is probable that his later love of war service was stimulated by his school education at the Shattuck Military Academy in Faribault, Minnesota.

In his boyhood and youth he cultivated a love of the great out-of-doors, living much at Lake Geneva, in Wisconsin, a picturesque spot where he roamed the woods with his rifle, bringing down now a squirrel, a rabbit, or a bird, upon which he demonstrated, in anticipation of his future professional tastes, the study of comparative anatomy.

Following his sport-loving tendencies, he distinguished himself in the hunting of big game in the Bitter-Root Valley and in the North Woods neighboring upon his

summer camp. The rod and reel had an especial lure for him and he found much of his recreation in whipping the wild streams of Minnesota for the speckled trout.

All these experiences entered into his keen worship of nature, twin of his appreciation of both art and music. Alike they served as the media of contact, with the world about him, of his exceptionally receptive mind.

As a student in the medical school of the University of Minnesota, whence he graduated in 1894, and in his early teaching of surgery, he proved the ready adaptation of his mental facility to practical use and power. He was recognized, when a very young surgeon, as a keen diagnostician and a brilliant operator.

Hardly had he entered upon his surgical career, in association with Dr. Frederick A. Dunsmoor, of the university staff, before his inherited tendencies invited him into the theater of war. The outbreak of the conflict between the United States and Spain, in 1898, intrigued him with a call he could not resist. He enlisted with the rank of first lieutenant and assistant surgeon, and later was promoted to the captaincy of the Thirteenth Minnesota Regiment. The early enrol'ment of this regiment was the second unexampled response of his State to the need of the country at war. He, with his command, was ordered to the Philippines, where he fought in the Battle of Manilla, August 13, 1898, against the Spaniards. After policing the City of Manila for several months his regiment, the Thirteenth Minnesota, was ordered out to guerrilla warfare against Aguinaldo and his insurrectos. In September, 1899, his regiment was ordered home, and after a parade in Minneapolis, Captain Law riding, with the field and staff officers, at the head of his men, he was mustered out in Saint Paul in October, 1899.

Arthur Ayer Law's already announced engagement to Helen E. Lougee culminated in their marriage in November of 1899. She and their two daughters, Elizabeth Law Fullerton and Mary Ayer-Law Webb, survive him. The strong family sense, born and bred of an English heritage into their American home, proved the ideal quality of companionship alike in their marriage and their parenthood. He was in love with his girls, as with his wife. Whether at home or afield, he was never so happy—and happiness was his normal habitus—as when his home companions were with him.

In the year 1918, he was tempted away from his home and his busy life—and again in the service of his country. With the opening, for the United States, of the World War, Base Hospital No. 26 was jointly organized and equipped by the University of Minnesota Medical School and the Mayo Clinic of the City of Rochester. Dr. Arthur Ayer Law was placed in command, with the rank of major, being promoted later to lieutenant colonel. He took an active part in the preparation of the Base Hospital, organizing it in Minneapolis and providing much of its equipment from contingent funds contributed for the purpose. He was later appointed a member of the Medical Council of National Defense.

In June, 1918, he was ordered to take Base Hospital No. 26 overseas. It was stationed at Allery in the Department of Saône-et-Loire. It did well and nobly

its share in the medical and surgical service of the War, as did all the Base Hospitals of the United States. It was ordered home in 1919. Later he received the coveted citation of the United States Government.

He had no illusions as to the causes and the results of the Great War. He put the whole burden of it where he believed it belonged. He looked all questions squarely in the face. He was a man without compromises and free of excuses for himself and equally so for anybody else. Its experiences entered into the very spirit of the man, but he was glad that his country was in the war and he with it.

He returned to his home and to his work with the same, but a tempered, spirit of joy. That joy had always expressed itself in service and it did so still. He resumed his allegiance to the University of Minnesota Hospital, the Glen Lake Sanatorium for the Tuberculous, and the Northwestern Hospital of Minneapolis.

In his practice he was governed, as he had always been, by but one consideration—the welfare of his patients.

Upon the teaching staff of the University of Minnesota, in its undergraduate and graduate medical faculties, he had risen in the ranks, from an assistant in surgery, to an instructor, and then to an associate professor of surgery.

In his profession at large he gave himself unsparingly to the support of the American Medical Association, the American Surgical Association, the American College of Surgeons (regent, 1923-1925; founder), the Western Surgical Association, the Southern Surgical Association, the Inter-State Post Graduate Medical Assembly of North America, the Southern Medical Association, the Minnesota State Medical Association, the Southern Minnesota Medical Society, the Minnesota Academy of Medicine, and the Minneapolis Surgical Society.

He was a member of all the principal social clubs of his city, and of the American Legion.

He was not a prolific writer and he sought conservative channels of publication. Nevertheless he was a steady contributor to the literature of his profession. In the quarter century of his active practice he issued fifty or more articles in the professional press. Those, among them all, in which he took the greatest satisfaction were his contribution to "The Master Surgeons of America," in the review of the life and work of his educational chief, Dr. James Edward Moore, and his two brief histories of Base Hospital No. 26. His bibliography of strictly surgical subjects, while not extensive, was as wide as the field of surgery itself. Among its topics are notable additions to the surgical story of his times.

His life long allegiance to the Episcopal Church was a matter of inheritance, as well as of choice. It was an expression of his love of beauty in word, as in spirit—a testimonial to his religious taste for order and good form in worship and in ritual. He was a consistent member of Saint Mark's Episcopal Church in his home city. From within its lovely walls and under its age-old, beautiful rites he was borne to his burial.

RICHARD OLDING BEARD.

EARLY AMERICAN MEDICAL SCHOOLS

ILLINOIS' FIRST MEDICAL SCHOOL

CARL E. BLACK, A.M., M.D., F.A.C.S., JACKSONVILLE, ILLINOIS

ILLINOIS was only ten years old when Illinois College (1829) began the instruction of its first classes. It is the oldest college in Illinois. It is difficult to visualize the conditions under which this school was established. It was opened for teaching just ten years after the first settler built his cabin in Morgan County and only four years after the town of Jacksonville was incorporated and became the county seat. In those four years over 600 settlers came in to make it their home. An unusual proportion of these new settlers were from Kentucky and Virginia, and from New England, and had enjoyed educational advantages, and they joined forces in establishing a college, and made their settlement one of the most important in the new state.

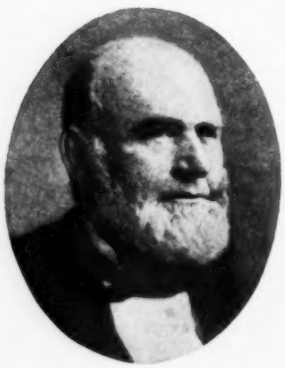
By 1840 the town had a population of twenty-five hundred and the trustees of the College planned to establish departments of medicine, law, and theology.

Samuel D. Lockwood, the first chief justice of Illinois, and Joseph Duncan, the fifth governor of Illinois, were members of the Board of Trustees. The Civil War governor, Richard Yates, was in the first graduating class from the liberal arts department. The school of medicine began its course of lectures November 1, 1843, although, as was customary in this pioneer country, some members of its faculty had been "taking students" for several years. It was the evident intention of the trustees to have opened the medical department earlier but there was difficulty in arranging its housing. It was finally housed in the attic of Beecher Hall. Looking at these low attic rooms today, it seems almost impossible that any kind of a school could have been housed there. The pioneer seemed to thrive on difficulties and inconveniences and the attic did not appear so impossible to him as it does to us today.

Beecher Hall is still in good repair and houses the two oldest college literary societies (for men) in Illinois.

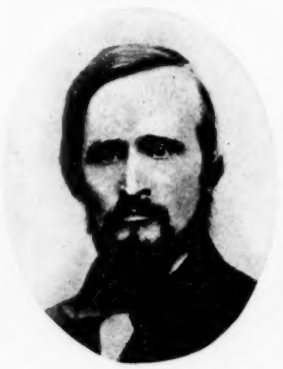
By its third year the medical school was provided with a new building. This was a plain, two story frame building and at the time was considered quite commodious. There was a small room under the stairway which was known as the "Salt Pork" room. In other words, the dissecting material from the neighboring cemetery, which was only half a mile away, was stored here.

Prior to 1843, 26 medical schools had been organized in the United States and 10 of them were in the Mississippi Valley. Six were organized in 1843. Half of the Valley schools were in Ohio;



David Prince

Daniel Stahl



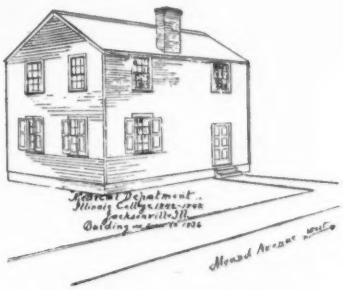
Henry Wing

2 in Kentucky; 2 in Missouri, and 1 in Louisiana. Two medical schools began their teaching in Illinois in 1843. The Illinois College School antedated Brainard's (Rush Medical College) School by a month—December 4, 1843.

The first catalog of the Illinois College School announced: "The course of lectures commences annually on the first of November and continues sixteen weeks. The cost of tickets to the full course of lectures is $60.00; tickets for private dissection, $5.00; graduation fee, including diploma, $10.00."

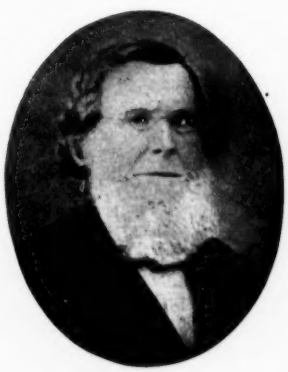
The first two presidents of the College, Edward Beecher and Julian M. Sturtevant, were clergymen and a number of the trustees were clergymen. They were members of the "Yale Band" and were really educational missionaries in the pioneer West. In New England they were known as the "Illinois Band." The trustees felt the urge of the missionary spirit when they announced to the medical department, that "students preparing for a missionary life, and wishing to pursue medical studies for that purpose, are admitted to the lecture free of expense." While there is no record that the medical faculty complained of this arrangement, it was a little hard on them as they received all fees to cover their services but they carried the entire expense of the medical school including rent, in exchange for the use of the medical building.

One of the requirements for the degree of doctor of medicine is especially interesting at this date. The catalog provided that "he (the student) must pass a satisfactory examination in all the branches of medical study, before the Medical Faculty, assisted by a Board of Censors, annually appointed for that purpose by the trustees." It was not always possible in the pioneer country to secure a board of "Censors," all of whom had the degree of doctor of medicine. The trustees were equal to the emergency, and conferred an honorary M.D. on these in order that the "Board of Censors" should be properly accredited. However, no harm was done as the list of censors shows that care was taken to secure practitioners of standing regardless of their deficiency in medical school training.



Medical Department, Illinois College, 1842–1848.

A catalog of the medical school was issued in January, 1848, but as far as we have been able to learn no medical classes were held after the spring of 1848. Just why the project, which had so satisfactory a beginning was so abruptly and unceremoniously discontinued does not appear. There is no record of the existence of debt incurred by this department. There was only one other medical school in Illinois, and that far away in Chicago. Compared with other departments, this one had by far the largest attendance and its students paid the largest fees and were in attendance the shortest time. Considerable money had been spent for a building. A good medical library and



Samuel Adams

Henry Jones

Edward Mead

"Old Beecher," the first college building erected (1829) in Illinois, now used as a home for literary societies of Illinois College, was the home of the first medical school in Illinois.

apparatus had been provided. In this school, as in many others of its day, there was a serious conflict between the liberal arts faculty, and the sciences, even in medicine. There was a great repugnance toward the men who practiced in the dissecting room.

Doctor David Prince, the professor of anatomy and surgery, was an enthusiastic follower of John Hunter, and especially of his preceptor and former associate, Reuben D. Mussey. Dr. Prince believed that every physician should be well grounded in anatomy, and the only way to acquire this knowledge was in the dissecting room. Dr. Prince saw to it that material for dissecting was provided, but he was evidently not careful about the feelings of the literary faculty or of the community in obtaining it.

Looking back at the situation in 1848, it seems probable that the "anatomy question" was the significant cause for the discontinuance of the medical department. No doubt the fact that the medical faculty bore all the expense, and often took their pay in student notes, had an influence.

An examination of the account book of Dr. David Prince during this period shows that he not only took notes from medical students but that he furnished a number of them dissecting material on credit, and also that in a number of instances, he furnished money for their board, books, and clothing. The books show also that in after years most of this money was paid back, often with interest. Considering the scarcity of cash, in those days it must have been a severe drain on the doctor's resources to make these advancements. It would have been easier for the medical faculty, if they had been supported by a better public opinion. The citizens had not yet learned that they had a moral and financial obligation in supporting professional education. The public wanted good physicians when sick but could not approve of the method by which the physician became efficient.

The following is a reproduction of the list of those who taught in the medical school, as it appears in the college catalog:

Accessus		Exitus
	Chemiæ et Historiæ Naturalis	
1838	Samuel Adams, M.D.	
	Medicinæ, Theorinæ et Præxeos	
1843	Daniel Stahl, M.D.	1844
1845	Johannes James, M.D.	1848
	Anatomices et Phisiologiæ	
1843	David Prince, M.D.	1845
1845	Johannes Leland Miller, M.D.	1847
	Obstetricii	
1843	Henricus Jones	1848
	Materia Medicæ et Therapeutics	
1843	Samuel Adams, M.D.	1845
1845	Edwardus Mead, M.D.	1846
1847	Henricus Wing, M.D.	1848
	Chirurgicæ et Chirurgicæ Anatomices	
1844	Gulielmus B. Herrick, M.D.	1844
1845	David Prince, M.D.	1848
	Chemiæ et Ætiologiæ Physicæ	
1845	Samuel Adams, M.D.	1848
	Sacre Theologiæ	
1849	Julianus M. Sturtevant, S.T.D. Praes.	

In its last analysis, the planting of the medical school in the pioneer State of Illinois was a missionary effort. Doctors were needed in these rapidly developing but isolated communities. The

roads were bad and the most rapid method of travel was by horseback. Doctors could not travel far to their patients nor could the settler send far for a doctor. The Medical School was an effort to meet this situation. That this school assembled an unusually good faculty is attested by the future accomplishments of the young men who composed it. All were excellent practitioners in after years, several achieved some national recognition and at least one became internationally known.

During its existence of five years there were 102 students in its classes and 30 men were graduated with the degree of doctor of medicine.

THE SURGEON'S LIBRARY

REVIEWS OF NEW BOOKS

FRIENDLY criticism is rarely graciously received; widespread condemnation is invariably accompanied by an aroused resentment. The Report of the Committee of the New York Academy of Medicine[1] presents one of the most invaluable studies of maternal mortality in a large metropolitan area which has ever been published. The text covers so many statistical facts presented in 89 tables with critical comment, and the appendix summarizes all data, that it would be quite impossible to cover the many main features; only a few may receive comment.

The first and most astounding pronouncement is that 17.8 per cent of the 2,041 maternal deaths in the three years of the study had the causes of death incorrectly recorded on the death certificate, the high spots being the suppression of the fact of the termination of pregnancy by abortion in 34.7 per cent, and of sepsis in 28.6 per cent. One may appreciate the significance of the elision of *abortion* on account of the possible stigma which may be reflected upon the patient or the family, and (or) may connate with the suppression of the fact of criminality associated with the death; the omission of sepsis presages a saving from censure upon the hospital or physician. Table IV gives a flaring picture of the relative value of vital statistics of the world. Certainly a public document deserves honorable treatment.

Section III deals with the *preventability of death.* Table V, A covers the principal causes of maternal death: of the 2,041 deaths, 698 (34.2 per cent) were determined to be not preventable, while 1,343 (65.8 per cent) were declared preventable. In Table V, B (Classification of Preventable Deaths by Responsibility), we find it stated that of these 1,343 "preventable deaths," 820 (61.1 per cent), 493 (36.7 per cent) and 30 (2.2 per cent) were due, respectively, to some neglect, error of judgment, culpability, or ignorance of physician, patient, or midwife. That the responsibility for the death from septicæmia was due to the physician in 81.7 per cent, patient in 14.6 per cent, and midwife in 3.7 per cent. There were a total of 231 albumenurics and eclamptics, of which 168 (72.7 per cent) were declared preventable. Space will not permit a multiplication of the facts presented; each item carries its own sting, and each carries a just ground for logical rebuttal. A hundred per cent allocation of responsibility in 2,041 deaths is a herculean task beyond the wisdom of any body of men. Every thoughtful obstetrician knows full well that the pragmatic operative furor is responsible for much of the censure which is heaped upon the present day American obstetric practice, and is responsible for many of the maternal (and fetal) deaths. We concur in the conviction that the modern obstetric trends were primarily promulgated by august obstetric authorities; the general practitioner accepted the dicta with avidity, and the laity, by wide propaganda, were convinced that the indiscriminate use of anæsthesia and routine operative intervention were the acmes of good obstetrics. This wide pragmatic obstetric surgery is expressed in the New York Hospitals (respectively 68, 66, 47, 42, 38 per cent). Operative furor, and neglect of prime prenatal care, are the two outstanding factors of responsibility for many deaths. But we would most emphatically take issue with the contention that it is possible to divide 2,041 maternal deaths into those (698) which were not preventable, and 1,343 which were preventable; and that of these 1,343 deaths, 61.1 per cent were due to the ignorance, mismanagement, error of judgment, etc., etc., of the physician. We feel that the Committee has ascended a Judgment Throne and passed edicts based upon faulty premises which Solomon himself would have found untenable. It would have been an happy occurrence if the Committee had selected a few definite criteria of preventable factors and discussed them dispassionately, for therein lie specific cures of puerperal risks, rather than have brought indiscriminate and unjustifiable condemnation upon the whole obstetric practice. Better co-ordinated obstetric curricula, saner and more conservative teaching and practice, and the inculcation in the minds of the laity of what sound obstetric care means, will accomplish more than ruthless condemnation.

In conclusion, this volume is an invaluable contribution, a priceless book of reference for those interested in the statistical side of maternal mortality —and if a new edition should ever appear it would be well that there be a sane rewriting of "The Preventability of Death." R. W. HOLMES.

[1] MATERNAL MORTALITY IN NEW YORK CITY: A STUDY OF ALL PUERPERAL DEATHS, 1930–1932. By The New York Academy of Medicine Committee on Public Health Relations. Ransom S. Hooker, M.D., F.A.C.S., Director of the Study. New York: The Commonwealth Fund, 1933.

THE 259 page monograph on air and fat embolism in the *Neue deutsche Chirurgie*[2] series can be recommended heartily to anyone interested in these

[2] NEUE DEUTSCHE CHIRURGIE. Established by P. von Bruns. Edited by Erich Lexer. Vol. lv.—DIE LUFT- UND FETTEMBOLIE. By Dr. med. Siegfried Hoffheinz. Stuttgart: Ferdinand Enke, 1933.

subjects. The author is privat-dozent in surgery and chief of the surgical clinic in Leipzig. A superficial survey of the literature had convinced him that knowledge of these two types of embolism still contained many uncertainties. He therefore has undertaken in this volume to present the most comprehensive picture possible of these two pathological conditions and to emphasize the problematical features of both subjects in order to stimulate further investigation. For this reason much attention is given to theoretical considerations. The two subjects are treated in separate "parts" instead of being welded together in one unit as he had originally hoped to do. While there are many points of contact between these two types of embolism the contact is essentially a loose one and not an organic union. To air embolism are assigned 132 pages; to fat embolism, 117 pages. The 9 pages remaining contain the bibliography with 950 titles on air embolism and 450 on fat embolism.

In order to bring some degree of variety into the inflexible material to be considered, the author has, as far as possible, chosen different arrangements for the two parts of the monograph. But even so, the outline of the two sections are very similar. Each part begins with chapters on "definition and general characterization" of the respective pathological conditions, and on the "history" of the development of our knowledge concerning them. These chapters are followed, in each case, by a long section on the "general pathology, pathological anatomy and pathological physiology" of air and fat embolism, respectively, in which are considered such subjects as portals of entry, conditions of entry, course and further fate of the air or fat entering the circulation. The causes of death in each instance are discussed at some length. Almost 30 pages are devoted to the pathological anatomy and pathology of fat embolism. The second section of each part includes the clinical aspects of air and fat embolism with discussions of their etiology, symptomatology, diagnosis, prognosis, prophylaxis, and treatment.

Of the 50 illustrations, 6 are in colors. Of special interest are the roentgenograms showing the presence of air in the right side of the heart. The typography is excellent. The author has refrained from the German habit of using long involved sentences and has produced a volume that can be read without too much difficulty by anyone with a reasonably good knowledge of the language. There is no index, but the table of contents is so constructed that the page on which any special phase of either subject is discussed can be readily found. J. P. Simonds.

NAUJOKS has adequately covered the field of birth injuries of the child in this brief monograph.[1] He first discusses the etiological factors, considers external trauma, pelvic contraction, and anomalous fetal development as well as injury during spontaneous and operative deliveries. The second half of the monograph is devoted to the injured child in which diagnosis, treatment, and prognosis are described. A number of illustrations are included, many of which illustrate gruesome and preventable injuries during examination and extraction of the child such as are seldom observed in this country. The German literature is quoted solely in the preparation of this work. Irving F. Stein.

VOLUME V of *The Practitioners Library of Medicine and Surgery*[2] confines itself to traumatic surgery. It is a compilation of treatises by 17 authors, several of whom are outstanding in their field, and includes surgical conditions resulting from direct or indirect injury. As in volume iv, which deals with surgical conditions which are nontraumatic in origin, this volume is aimed primarily for the general practitioner.

The chapter on fractures deserves especial commendation. In the limited space permitted, Professor Voshell has beautifully covered the tremendous field of fractures, a subject which ordinarily would cover several volumes. This chapter is exceedingly meaty, all unnecessary facts having been eliminated. The chapter is profusely illustrated making this section of inestimable value to the practitioner.

The chapter on amputations by Thomas Orr is excellent, and should be of value to the specialist as well as to the general practitioner. Several types of amputations are described which have been more or less discarded, but Orr probably included these for completeness.

One of the most enlightening chapters, and especially useful in this day of speed, is that by Beck on "Traumatic Lesions of the Thorax and Thoracic Viscera." In this chapter the author covers the physiology of the pleuræ, lungs, mediastinum, pneumothorax, massive collapse of the lungs, traumatic asphyxia, wounds of the thorax, trauma to the mediastinum, wounds of the pericardium and the heart, as well as many other related conditions. This should be a most instructive adjunct to the average man, even though it be the work of a most experienced specialist.

Of interest to the man doing industrial surgery is the rather short but concise and instructive chapter on "Traumatic Neuroses." Interesting data is brought forth which should prove most valuable to the man engaged in this type of work.

The entire volume is clearly written, not too technical, well illustrated, and should most certainly be welcomed at this time. Earle I. Greene.

THE author of *Laboratory Medicine*[3] in his revision, has succeeded very well in his purpose of providing a suitable guide for both students and practitioners. The chapter guiding the practitioner in the choice of tests and the indications for these

[1] Die Geburtsverletzungen des Kindes. By Prof. Dr. Med. Hans Naujoks. Stuttgart: Ferdinand Enke, 1934.

[2] The Practitioners Library of Medicine and Surgery. Vol. v.—Traumatic Surgery. New York and London: D. Appleton-Century Company, 1934.

[3] Laboratory Medicine; a Guide for Students and Practitioners. By Daniel Nicholson, M.D. 2d ed. Philadelphia: Lea & Febiger, 1934

tests is of especial value at this time when there is a noticeable tendency to require laboratory work without due consideration of its real value in diagnosis and treatment.

The subject matter is clearly presented and the charts and other illustrations well chosen. The most recent technical procedures are presented in detail in an unusually simple manner.

The type is large and clear and the index quite thorough. HOMER K. NICOLL.

VOLUME VI[1] of the system of medicine entitled *The Practitioners Library of Medicine and Surgery* is a book of 900 pages on "Obstetrics and Gynecology."

Two-thirds of this volume is devoted to obstetrics, the remainder to gynecology. Fourteen men have contributed to the volume which was edited by Luther K. Musselman of Yale. The outstanding chapter in the volume is the one on the pathology of labor by Herbert Thoms. While Thoms points out the fallacy of relying on external pelvimetry for determining the probable outcome of a given case, and offers a rather accurate method of measuring the pelvic inlet by roentgenography, one can hardly agree with him that this is a necessary procedure in all primiparæ.

Thoms omits a very important procedure in enumerating the various manual methods of attempting to determine the presence or absence of disproportion; the Hillis impression method takes its place along with the methods of Kerr and Mueller and ofttimes is much more practical.

The volume is poorly illustrated, and this is especially true in the section devoted to gynecology.

A volume on obstetrics and gynecology for the practitioner should present the subject matter in the simplest form, perhaps outline, most of the space being devoted to diagnosis and treatment since these are the phases of the subject which concern the practitioner most. The book should be profusely illustrated, each step in a procedure being accurately described. The practitioner is not concerned with the historical side of a problem when he is confronted with a grave situation. He wants a quick, ready reference where the information may be gained in the shortest possible time and in the most concise and accurate form. It is impossible to carry out such an idea without clear illustrations.

CHESTER C. DOHERTY.

THIS *Neuroanatomy*[2] by Globus is primarily "a guide for the study of the form and internal structure of the brain and spinal cord," and contains 53 plates of rough and incomplete outline figures of dissections and sections through the brain. These outlines supply the student with uniform foundations for careful laboratory exercises; he is expected to complete the drawings and label them in the course of study.

A brief text including daily assignments occupies 122 pages of the book. This is developed especially for the author's course and can scarcely be expected to fulfill the requirements of every course in neuroanatomy. Arrangement is orderly and neat but illustrations are fewer than could be desired (36) and, unfortunately, are without labels. In the matter of study assignments, some instructors will unquestionably feel that class morale is being dealt staggering blows by expecting students to "write a concise summary of accepted views and facts regarding the general plan which forms the groundwork for the structural organization of the central nervous system" and to "discuss briefly the contributions to neuroanatomy made by: Nissl, Weigert, Golgi, Cajal, Harrison and Hortega" on the first laboratory period. It is the reviewer's opinion that it is doubtful whether a very large percentage of a normal class can do such assignments justice at the completion of the course. WILLIAM F. WINDLE.

ADDED material and revision bring up to date Beckman's deservedly popular book *Treatment in General Practice*.[3] The author has succeeded in the difficult task of presenting in one volume the treatment of the principal diseases of man exclusive of the legitimate specialties. He has quoted the principal writers on the individual subjects included, and has added his own, frequently pungent comments based on personal experience. A well selected bibliography is helpful to those who wish to study the original articles quoted. Discussion of treatment is prefaced by a description and historical survey of the disease.

In a work of this scope and character differences of opinion as to the value of certain agents in certain conditions are inevitable, but such criticisms are minor. In the opinion of the reviewer, for example, the praise of cinchophen as a valuable addition to our armamentarium, although it is followed by a warning as to possible dangers arising from its use, were better replaced by a flat recommendation against its use. The author does not attempt, however, to outline the management of an individual case. Instead, he describes methods, quotes results enumerates and often evaluates the therapeutic agents available so that an intelligent selection of a method of procedure is possible. The chief value of the work is the presentation in one volume of the principles and methods of treatment believed to be the best available at the present time in the management of a great variety of diseases. The book should continue to serve as a valuable reference and guide to the general practitioner.

WALTER H. NADLER.

[1] THE PRACTITIONERS LIBRARY OF MEDICINE AND SURGERY. Vol. vi.—GYNECOLOGY AND OBSTETRICS. New York and London: D. Appleton-Century Company, 1934.

[2] NEUROANATOMY; A GUIDE FOR THE STUDY OF THE FORM AND INTERNAL STRUCTURE OF THE BRAIN AND SPINAL CORD. By J. H. Globus, B.S., M.D., 6th ed., rev. and enl. Baltimore: William Wood and Co., 1934.

[3] TREATMENT IN GENERAL PRACTICE. By Harry Beckman, M.D., 2d ed., rev. and enl. Philadelphia and London: W. B. Saunders Company, 1934.

IN reading the preface to *The Origin of Cancer* by Lockhart-Mummery,[1] one is struck by the statement: "This quest has at last been successful and the origin of cancer is now understandable." Coming from a man for whom the profession has such a high regard, this statement incites, to say the least, an intense desire to learn what the theory is.

The author discusses the facts about tumors, old theories about the causes of tumors, normal and abnormal growth, the influence of heredity, the genetic theory of inheritance, somatic cell mutations, malignancy, frequency of mutation and again tumors, and, from carefully selected evidence, he propounds a theory well stated in the preface:

"The vast number of different varieties and species of living organisms that exist in the world today have been produced by chance changes or mutations in the nuclei of germ cells, sorted out and preserved by the aid of natural selection. We know that such genetic changes in cells are passed on to all succeeding descendants of the cells in which they occur, and if the change is one which is compatible with survival of the organism, will result in a variation in one direction or another, perhaps for something better, perhaps for something worse. It is by such means that we ourselves have been evolved from more primitive organisms.

The important variations in organisms which have acted as the raw material for evolution have resulted from genetic mutations in germ cells. Tumors and cancer are variations from the normal, similarly produced by mutations occurring in the nuclei of somatic or body cells.

Heredity takes two forms, that of the parent and the child (the organism as a whole) and that of the cells themselves which make up the organism. The child develops according to the cells it has inherited from its parents and the adult tissues develop according to the cells inherited from the original embryo. Any genetic change in the cell nuclei will be permanent during the life of the organism, and if the change be one which involves an increased rate of growth, a tumor or cancer may result. *In fact, cancer is the result of a genetic change in a normal growing somatic cell.*"

The author states that a number of substances are known to result in gene mutations when applied to experimental animals, dibenzanthracene being the most powerful. Tar will do likewise. Such agents as X-ray and the rays of radium "have a special capacity for producing mutations of genes or transmutation of chromosomes." In the human the cause is still in question; however, the appearance of cancer in homologous twins creates a suspicion.

The theory is open to much doubt and criticism, yet any one who is interested in malignant disease will derive great interest and food for much thought while reading this little volume.

JOHN A. WOLFER.

[1] THE ORIGIN OF CANCER. By J. P. Lockhart-Mummery, M.A., M.B., B.C.(Cantab.), F.R.C.S.(Eng.). London: J. & A. Churchill, 1934.

THE 454 page monograph[2] by Martel and Guillaume, based on the authors' 130 cases of posterior fossa tumors which were operated on in their clinic between January, 1930, and January, 1933, has been divided into 4 parts.

The first part describes the general symptoms from a physiological and anatomical standpoint. This again is subdivided into 4 chapters, the first of which describes the symptoms produced by increased intracranial pressure, namely, headaches, vomiting, papillœdema, and hydrocephalus. Chapter 2 consists of a discussion of the body attitude, disturbances of body tonicity, changes in equilibrium, and co-ordination and vestibular disturbances under the general heading of the cerebellar vestibular syndrome. The involvement of the cranial nerves is taken up in the third chapter, and motor, sensory, and reflex disturbances are included in chapter 4.

In part II the tumors found in the posterior fossa are considered from a histological anatomical classification, whereas in part III they are classified according to the localization in the posterior fossa. A chapter each has been devoted to a general and rather complete discussion of, first, tumors of the midline; second, tumors of the cerebellar hemispheres; third, tumors of the cerebellar pontine angle; fourth, tumors of the peduncles; fifth, arachnoiditis of the posterior fossa; and sixth, studies of lesions simulating a neoplasm in the posterior fossa.

Surgical treatment as advocated by De Martel covers some 73 pages, and many illustrations are included. In contrast to the suboccipital craniotomy performed by most American neurosurgeons, De Martel and his associates prefer the suboccipital osteoplastic flap. This type of operation and also De Martel's operative position are described in detail in this chapter.

Many cases are described in detail to illustrate the various types and locations of posterior fossa tumors. The bibliography is comprehensive, especially of the French literature. The simplicity of the language and the clearness of the authors' writing style allows for easy reading even for one who does not have an extensive knowledge of French. The monograph is a worth while addition to any medical library. DAVID A. CLEVELAND.

THE names of the eminent writers of *Lehrbuch der operativen Geburtshilfe*[3] are sufficient guarantee that it is a book well worth reading. The first edition of the book was originally written by Winter with the assistance of Benthin and Naujoks and was essentially an elaboration of his contribution to the Halban-Seitz *Biologie und Pathologie des Weibes*. The advice given is based not only upon

[2] LES TUMEURS DE LA LOGE CÉRÉBELLEUSE; FOSSE CÉRÉBRALE POSTÉRIEURE; DIAGNOSTIC ET TRAITEMENT. By Th. De Martel and J. Guillaume. Paris: G. Doin et Cie., 1934.

[3] LEHRBUCH DER OPERATIVEN GEBURTSHILFE FUER AERZTE UND STUDIERENDE. By Prof. Dr. Georg Winter and Prof. Dr. Joseph Halban in collaboration with Prof. Dr. W. Benthin and Prof. H. Naujoks. 2d enl. rev. ed. Berlin and Vienna: Urban and Schwarzenburg, 1934.

the vast experience of the authors but also upon the results of other authorities. The indications and technique of every obstetric operation are given in minute detail. Furthermore, every type of injury to mother and child which may result from these operations is thoroughly discussed from the point of view of prevention, actual occurrence, and treatment. The section on forceps operations is particularly thorough and various types of instruments are described, including the Kielland forceps.

The different types of cæsarean section are described and illustrated but the authors prefer the intraperitoneal or transperitoneal type. In the discussion on internal podalic version, Winter properly warns that this intervention should not be practiced until the cervix is completely effaced and dilated so that immediate extraction may be performed. He proves the dire effects which occur for both mother and baby in the cases in which extraction is forced through an incompletely dilated cervix or in which the extraction is delayed because the cervix is not sufficiently dilated to permit delivery.

The book which is intended for general practitioners is written in simple, lucid language. The illustrations are abundant, clear, and instructive. Many of them unfortunately show operations being performed with ungloved hands. The illustrations showing Schultze's swingings for the resuscitation of asphyxiated newborn babies should have been omitted because these swingings are dangerous. A number of illustrations are colored and others are arranged on large plates in such a way that each plate depicts all the stages of an obstetric operation. Even for those who cannot read German the book will prove instructive because the illustrations are self-explanatory. The book should prove helpful not only to general practitioners but also to obstetric specialists.

J. P. GREENHILL.

BOOKS RECEIVED

Books received are acknowledged in this department, and such acknowledgment must be regarded as a sufficient return for the courtesy of the sender. Selections will be made for review in the interests of our readers and as space permits.

THE ANÆMIAS. By Janet M. Vaughan, D.M.(Oxon.), M.R.C.P. (Lond.) With notes on normal and pathological erythropoiesis by Hubert M. Turnbull, D.M.(Oxon.), F.R.C.P.(Lond.) London: Oxford University Press, 1934.

X-RAY AND RADIUM INJURIES; PREVENTION AND TREATMENT. By Hector A. Colwell, M.B., Ph.D., M.R.C.P., D.P.H., and Sidney Russ, C.B.E., D.Sc., F.Inst.P. London: Oxford University Press, 1934.

THE MEDICAL AND ORTHOPÆDIC MANAGEMENT OF CHRONIC ARTHRITIS. By Ralph Pemberton, M.S., M.D., F.A.C.P., and Robert B. Osgood, A.B., M.D., F.A.C.S. New York: The Macmillan Company, 1934.

DIE PERIODISCHE FRUCHTBARKEIT UND UNFRUCHTBARKEIT DES WEIBES; DER WEG ZUR NATUERLICHEN GEBURTENREGELUNG. By Professor Dr. Hermann Knaus. Vienna: Wilhelm Maudrich, 1934.

COLLECTED PAPERS OF THE MAYO CLINIC AND THE MAYO FOUNDATION. Edited by Mrs. Maud H. Mellish-Wilson, and Richard M. Hewitt, B.A., M.A., M.D. Volume xxv, 1933, published May, 1934. Philadelphia and London: W. B. Saunders Company, 1934.

THE MERCK MANUAL OF THERAPEUTICS AND MATERIA MEDICA; A SOURCE OF READY REFERENCE FOR THE PHYSICIAN. 6th ed. Rahway, N. J.: Merck & Co., Inc., 1934.

I NEURINOMI NEL QUADRO DEI TUMORI GASTRICI BENIGNI. By Dr. Mario Ronzini. Bologna, Italy: L. Cappelli, 1934.

STUDIEN UEBER KNOCHENIMPLANTATION UND KNOCHENNEUBILDUNG, IMPLANTATION VON "OS PURUM" SOWIE TRANSPLANTATION VON "OS NOVUM." By Svante Orell. Supplement xxxi, Vol. lxxiv, *Acta Chirurgica Scandinavica*. Göteborg, 1934.

ANNALS OF ROENTGENOLOGY; A SERIES OF MONOGRAPHIC ATLASES. Edited by James T. Case, M.D. Vol. xvi. FOREIGN BODY IN AIR AND FOOD PASSAGES. By Chevalier Jackson, M.D., and Chevalier L. Jackson, M.D. New York: Paul B. Hoeber, Inc., 1934.

APPLIED PHYSIOLOGY. By Samson Wright, M.D. F.R.C.P. 5th ed. New York and London: Oxford University Press, 1934.

NEPHRITIS AND ALLIED DISEASES; THEIR PATHOGENY AND TREATMENT. By Robert Platt, M.D.(Sheff.), M.R.C.P.(Lond.). London: Oxford University Press, 1934.

PORTER LECTURES. SERIES III. BENIGN AND CANCEROUS GASTRIC DISTURBANCES. By J. Shelton Horsley, M.D. Lawrence, Kansas: University Extension Division, University of Kansas, 1934.

MANUAL OF THE DISEASES OF THE EYE; FOR STUDENTS AND GENERAL PRACTITIONERS. By Charles H. May, M.D. 14th rev. ed. Baltimore: William Wood and Company, 1934.

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CORRESPONDENCE

REPORT OF COMMITTEE OF NEW YORK OBSTETRICAL SOCIETY, ON MATERNAL MORTALITY

To the Editor: In November, 1933, the Commonwealth Fund of New York published a book entitled *Maternal Mortality in New York City, A Study of All Puerperal Deaths 1930-1932*, by the Committee on Public Health Relations of the New York Academy of Medicine.

On November 20, 1933, the Medical Information Bureau of the Academy of Medicine released to the daily newspapers an abstract of this book under the title, *Why Women Die in Childbirth.* Although very properly presenting many of the outstanding facts in this excellent study, the newspaper articles created certain impressions that were unnecessarily alarming and misleading. With a desire to correct these unfortunate impressions concerning the Maternal Mortality Report, to clarify certain points at issue, and to secure constructive suggestions for the improvement of existing conditions, the New York Obstetrical Society, on March 13, 1934, appointed a committee to take the entire subject under consideration and make recommendations.

The report of this committee herewith presented was read and endorsed by the New York Obstetrical Society at a regular meeting on April 10, 1934. The committee was asked to continue and instructed to formulate plans to carry out the recommendations of its report.

EDWARD A. BULLARD, M.D.
President, New York Obstetrical Society.

Mr. President and Members of the Society: Your committee desires to make its report, signed by all its members. We have felt it desirable to report on the following topics:

I. PREVENTABILITY

a. Your committee feels that it is impossible in all cases to determine preventability and agrees entirely in this respect with the report when it says, "it was realized that, with our present knowledge, it was impossible to arrive at a scientifically correct determination of preventability." Furthermore the committee feels that the report has gone too far in placing this responsibility.

b. Instead of judging a death as preventable it seems far wiser to your committee to judge such a death as associated with a controllable cause.

c. Your committee feels that in the release to the newspapers it should have been stated *the high maternal death rate in New York City is due largely to controllable causes*—instead of stating as it did that, "responsibility for the occurrence of the 1,343 deaths which the committee adjudged preventable was distributed amongst physicians, patients, and midwives. To the medical group is charged 61.1 per cent of the preventable deaths, to the patient 36.7 per cent of the deaths, and to the midwives 2.2 per cent of the total of these deaths."

d. Your committee feels that the conclusions in the report, *as well as those released to the lay press*, regarding preventability and responsibility may result in unfair criticisms or even unjust law suits for malpractice.

e. Your committee feels that in this vicinity, the New York Obstetrical Society is the most authoritative body in any matter pertaining to childbirth and as such this society should go on record, not only in its own archives but also in the lay press, as to its opinion on all controversial statements—e.g., operative deliveries, such as forceps, version, cæsarean sections, also anæsthesia, analgesia, home and hospital deliveries, and the complications of pregnancy, labor and the puerperium.

II. MIDWIVES

a. Your committee believes that the report released by the Academy to the public distorted the facts as to preventability of midwife deaths.

b. Your committee believes that any accurate release to newspapers on preventability should give the percentage of preventable mortality for the physician group and for the midwife group, which according to the report is 68 per cent for the former and 75 per cent for the latter.

c. Your committee believes that while there is need for better training and supervision of the present licensed midwives, there is no need for training or licensing of additional midwives. The records show that during the past 20 years in the City of New York there has been a steady decline in the practice of midwives—from 50 per cent to 8.5 per cent at the present time. In order to accomplish the better training and supervision of the existing midwives, we recommend that the New York Obstetrical Society offers its services to the commissioner of health of the City of New York.

d. Your committee believes that the practice of obstetrics will never be elevated to the position it rightly deserves as long as the midwife is permitted to practice. The profession, as well as the majority of the laity, is perfectly cognizant of the limitations of the midwife, and the teachers and leaders of obstetrics should, by now, appreciate the inadequacy of any system which introduces incompetency in competition with scientific knowledge.

III. HOSPITAL AND HOME DELIVERIES

a. Your committee believes that the report does not differentiate hospitals along lines of efficiency and equipment as laid down by the American College of Surgeons and the American Medical Association. The American College of Surgeons has published minimum standards for hospitals taking obstetric patients and we feel that these standards should have been utilized in classifying the hospitals of New York City. If this scheme had been followed, the final conclusions as published by the report, regarding hospital deliveries, would have been more in keeping with the facts and it would inevitably have recommended hospital delivery in preference to home delivery except in so far as the inadequate hospital is concerned. Furthermore we recommend that this latter type of hospital be placed under the supervision of a regional committee, in co-operation with the Department of Hospitals.

b. Your committee recommends that the New York Obstetrical Society should approve home deliveries only under ideal conditions as to competent medical attendance or supervision, equipment and assistance.

IV. OPERATIONS

Your committee feels that the report did not emphasize the fact that many operations were undertaken without sufficient indications in unskilled hands. We all know that operative deliveries, with good indications in skilled hands, are necessary. They are merciful and life-saving and they constitute one of the great advances of modern obstetrics.

V. ANÆSTHESIA AND ANALGESIA

Your committee believes that the use of anæsthetics and analgesics, when properly selected and properly administered, are valuable and indispensable and should be encouraged. They are not only humane but tend to prevent unnecessary and too early interference with the natural progress of labor and *per se* do not add to the maternal or fetal death rate, or to operative interference.

VI. EDUCATION

Your committee is unanimously of the opinion that the New York Obstetrical Society should go on record in the medical and lay press as to its attitude regarding education and training in obstetrics and gynecology. This seems necessary in order that the society may use its full influence in an endeavor to accomplish the following:

a. The medical schools in New York City should allow as much time for the undergraduate teaching of obstetrics as is allotted to surgery or medicine. The committee is of the opinion that one of the strongest factors in reducing maternal mortality is better teaching of obstetrics in our medical schools. Obstetrics and gynecology *must* be placed on a par with medicine and surgery in every first class medical school in this country.

b. Hospital training in obstetrics for those who plan to practice obstetrics must be adequate. An obstetrical interneship should not be less than one year, and a general rotating interneship in which obstetrics is included, should be at least two years, in order to allow a minimum of six months for obstetrics.

c. All university and other qualified hospitals should utilize their facilities, wherever possible, to offer postgraduate courses in obstetrics and gynecology.

d. Only through these three factors, adequate undergraduate teaching, thorough hospital training, and postgraduate courses, will the obstetrical standards of the work in all our hospitals be elevated to the required level of efficiency and safety.

e. Furthermore the lay public, through the various public health agencies, including the Department of Health, should be informed of the requirements of a physician doing obstetrics; the standards of hospitals taking obstetric cases; and finally what the patient herself should know about pregnancy, labor, and the puerperium.

VII. PUBLICITY IN THE LAY PRESS

Your committee recommends that the following be an official release, made at this time, from the New York Obstetrical Society to the lay press:

"The New York Obstetrical Society after careful study and discussion of the *Report on Maternal Mortality in New York City*, by the Public Health Relations committee of The New York Academy of Medicine, releases the following official statement to the lay press:

"This society believes that the valuable and excellent report of the committee has, in its publication in the lay press, been misrepresented. It believes that because of this publication, the laity and many of the medical profession have gained false impressions concerning childbirth and maternal mortality in this city. A careful scrutiny and analysis of the report itself will correct these false impressions. Such scrutiny and analysis, however, for obvious reasons, will not be made, except by a comparatively few doctors especially interested.

"This society believes, therefore, that it is necessary to issue this statement, in the lay press, both to correct false impressions previously created, and to give its authoritative opinion on controversial subjects connected with childbirth in New York.

"The statement was made in the lay press that of the 2,041 maternal deaths occurring in the three years of study, 65.8 per cent were preventable, and of these 1,343 preventable deaths, 'the predominating responsibility was charged to the medical group in 61.1 per cent of the cases, to the patients themselves in 36.7 per cent of the cases, and to the midwives, who handled only a small number of cases of the uncomplicated type, in 2.2 per cent of the fatalities.' This society believes that the facts do not warrant this statement. According to the report, responsibility is ascribed to the physician in 678 maternal deaths, which is 47 per cent of the deaths occurring among patients attended by the physician,

while the midwife was responsible for 29 maternal deaths, or 60.4 per cent of the deaths in women attended by the midwife. This is the only fair way to regard the deaths in the physician and midwife groups, because when expressed as a percentage of *all* deaths, the midwife figure is materially reduced due to the fact that she attended only 8.47 per cent, and the doctor 91.5 per cent of all confinements. Furthermore, it must be pointed out that it is an almost impossible task to ascribe responsibility in a large percentage of cases, contrary to the conclusions of the Report.

"Many of the maternal deaths were undoubtedly associated with controllable causes. Some of these causes, however, existed long before the patient was seen by the attendant and even before pregnancy. Elimination of these causes would presuppose adequate medical care from infancy, and *that* many of these patients did not have. With regard to preventability, however, this society feels that it is often impossible to determine preventability and agrees entirely with the report itself when it says, 'it was realized that, with our present knowledge, it was impossible to arrive at a scientifically correct determination of preventability.' How then could it be possible to publish in the lay press the exact percentages of responsibility, in the case of the doctor, the patient and the midwife?

"This society feels that the press report has given the impression, unmistakably, that all of the 2,041 maternal deaths, in the three years of study, occurred in actual childbirth from puerperal causes. The report shows clearly, however, that 40 per cent of these deaths occurred in early pregnancy and from non-puerperal causes; 477 being due to abortions and ectopic gestations, and 344 to extra-puerperal causes; and consequently only 1,220 of the 2,041 deaths listed occurred in actual childbirth from puerperal causes. This gives a maternal mortality rate in actual childbirth from puerperal causes of 3.5 per 1,000. The figure, 5.9 per 1,000, published in the lay press, was the total death rate from all causes whatsoever, occurring in pregnant women. The society believes that the public should understand the meaning of these two sets of figures.

"The published report in the press stresses the fact that operative deliveries carry a maternal mortality five times as high as do spontaneous deliveries and states that, 'any such disparity as that shown in these figures is a certain indictment of those undertaking the interference.' This society feels that such indictment is grossly misleading. What the committee had in mind, in giving out this statement, was that operative deliveries without good indication, in unskilled hands, tend to increase maternal mortality. The committee knows, as all obstetricians know, that operative deliveries at times are absolutely necessary for the safety of the mother or baby, and that, with good indications, in skilled hands, they are merciful, life-saving, and constitute one of the greatest advances of modern obstetrics. Under such conditions, operative deliveries do not increase maternal mortality, but, on the contrary, lower it, together with fetal mortality.

"The press report states that cæsarean section is rapidly on the increase, and further says, 'while 2.2 per cent of all deliveries were made by cæsarean section, this operation was responsible for almost one-fifth of all the deaths.' This society believes that this statement is most misleading, unless carefully explained. The society deplores the performance of this operation as done too frequently with insufficient indication by the unfit. But the fact remains that the operation is absolutely essential to life of mother and baby in many instances, due to the physical structure of the mother, or for other causes. Many obstetricians in this city can show a large series of cæsarean sections with very low maternal mortality, or even with no mortality whatever. Done skillfully, at the proper time, cæsarean section carries a comparatively slight risk to the mother and practically none to the baby. Any one caring to read the records of obstetric deliveries before the accepted use of cæsarean section, will be shocked at the horror of some of the agonizing, long-drawn-out labors, ending in disaster to both mother and baby. Cæsarean section is one of the greatest blessings to womankind. It is its *abuse* only that must be deplored.

"The press report states that 1.9 per 1,000 of the 1,343 'preventable' deaths occurred in the home, while 4.5 per 1,000 occurred in hospitals. It says further, 'it would seem that the present attitude toward home confinement requires re-examination, and a program looking toward an increase in domiciliary obstetrics, deserves careful investigation.' This society is of the opinion that delivery in a well organized and well equipped hospital is safer than home delivery. This society believes that obstetrics is no longer a one man job, and that home deliveries should not be encouraged, unless they can be conducted with every safeguard of medical supervision, equipment, and assistance. This, it is well known, is rarely the case. Moreover, the society believes that the lower mortality in home, compared with hospital deliveries, as found in the report, is easily accounted for by the fact that usually only the short and normal labors are conducted at home, while the protracted and difficult ones are transferred to hospitals, with the patients often in desperate or dying condition. Deaths of such patients swell the hospital records, but they should properly be listed as fatalities from home deliveries. If they were, home deliveries would be found to carry a higher mortality than those in hospitals. This is what might be expected.

"The press report as given out by the committee, expresses the belief that the use of anæsthesia, among other causes stated, 'is responsible for the increase in operative deliveries.' This society thinks that this belief is ill founded, and on the contrary, is of the opinion that anæsthesia and analgesia (partial anæsthesia), properly selected and skillfully administered, are essential and valuable and should be

encouraged, not only as humane, but also as tending to prevent unnecessary and too early interference with the natural progress of labor, and that they do not increase operative delivery. Furthermore, this society is convinced that anæsthesia and analgesia, in the hands of well trained doctors, do not add to the maternal or fetal death rate.

"This society wishes to call attention to the fact that the specialty of obstetrics is not an exact science; that some women may die in childbirth after normal confinements and where no one is to blame, patient, doctor, or hospital. It is the aim of good obstetrics to lower the maternal mortality to an irreducible minimum, as demonstrated by the better hospitals in our own and other communities. This society believes that it is well for the public to consider these facts before resorting to hasty criticism.

"This society is of the opinion that improvement in obstetric conditions cannot be expected from dependence on the midwife. Midwives are decreasing in numbers. In this city twenty years ago approximately five times as many women were delivered by them as today. They are frequently a menace to the health of the women under their supervision. This society believes that the care of the expectant mother is too important and too technical to be intrusted to attendants without complete and adequate medical training; and it also believes that all parturient women in the city, before long, can be cared for by the medical profession.

"This society is, therefore, of the opinion that, for the present the midwives now licensed in the City of Greater New York should be properly supervised and examined, and it is ready to co-operate with the Department of Health and other organizations in this matter. It, however, is opposed to the training of additional midwives.

"This society is of the opinion that the maternal mortality can be materially reduced by allowing more time for the teaching of obstetrics in our medical schools, by placing more emphasis on such undergraduate teaching, by concerted postgraduate and hospital training for those doctors who will practice obstetrics either exclusively or otherwise, and lastly by providing adequate hospital facilities for maternity patients, which should include, as advised by the American College of Surgeons:

a. Segregation of obstetric patients from all others in the institution.

b. Special facilities available for immediate segregation and isolation of all cases of infection, fever, or other conditions inimical to the safety and welfare of patients within the department.

c. Adequately trained personnel, the entire nursing staff to be chosen specially for work in this department and not permitted to attend other cases during this time on obstetric service.

d. Readily available, adequate laboratory and special treatment facilities under competent supervision.

e. Accurate and complete clinical records on all obstetric patients.

f. Frequent consultations encouraged on obstetric service, a consultation made obligatory in all cases in which major operative procedure may be indicated.

g. Thorough analysis and review of the clinical work of the department each month by the medical staff with particular considerations to deaths, infections, complications, or such conditions as are not conducive to the best end-results.

h. Adequate theoretical instruction and practical experience for student nurses in prenatal, parturient, and postpartum care of the patient, as well as the care of the newborn.

"This society is of the opinion that the general public should know that it is necessary for all women to have adequate medical supervision and care during pregnancy, labor, and the postpartum period, such supervision and care to begin early in pregnancy and to be continuous throughout the postpartum period:

a. In order to safeguard the health of both mother and child.

b. In order especially to control the infections, toxæmias, and hæmorrhages that this study and others have shown to be real menaces to life.

c. In order to minimize the danger of death or serious invalidism following abortions, spontaneous or induced."

VIII. CO-OPERATION WITH MEDICAL ORGANIZATIONS AND PUBLICITY TO THE MEDICAL PROFESSION

Your committee recommends that the New York Obstetrical Society appoint a committee to co-operate with the Department of Health, the Department of Hospitals, and other agencies, in order to accomplish the above recommendations regarding midwife practice, undergraduate and postgraduate education, regulation or registration of physicians practicing obstetrics, supervision of all hospitals doing obstetrics which do not conform to the minimum standards of the American College of Surgeons and to evolve a plan for a Board of Regional Consultants in Obstetrics and Gynecology. We further recommend that, with respect to our report, such a committee be empowered to consider and act in the matter of publicity to the medical profession, as well as to the lay public.

IX. FETAL MORTALITY

Your committee recommends that in any further study of maternal mortality, fetal mortality should be included as giving a more complete and accurate analysis of our results in childbirth.

ELIOT BISHOP, *Chairman*
HARVEY B. MATTHEWS, *Secy.*
GEORGE H. RYDER
HENRICUS J. STANDER
EDWIN G. LANGROCK
Committee

CLINICAL CONGRESS OF AMERICAN COLLEGE OF SURGEONS

WILLIAM D. HAGGARD, Nashville, *President* ROBERT B. GREENOUGH, Boston, *President-Elect*

FRANKLIN H. MARTIN, Chicago, *Director-General*

ARTHUR W. ALLEN, *Chairman;* ERNEST M. DALAND, *Secretary, Committee on Arrangements*

PLANS FOR THE 24TH ANNUAL CLINICAL CONGRESS IN BOSTON

PLANS for the twenty-fourth annual Clinical Congress of the American College of Surgeons to be held in Boston, October 15–19, 1934, are approaching completion. The surgeons of that great medical center have organized under the leadership of a strong and representative committee planning to provide for the Fellows of the College and their guests a program of surgical clinics and demonstrations that will present a most complete showing of their clinical activities in all departments of surgery. The Committee on Arrangements has been assured of the hearty cooperation of the clinicians at the medical schools and more than thirty hospitals that will participate in the clinical program.

There is published in the following pages a preliminary program of clinics and demonstrations as prepared by the Committee on Arrangements. It should be noted that operative clinics and demonstrations in the hospitals are scheduled for the afternoon of Monday, October 15, beginning at 2 o'clock, and for the mornings and afternoons of each of the four following days. The schedules appearing herewith are to be revised and amplified as the work of the program committee progresses during the intervening months. The final program will be published from day to day during the Congress—a complete and accurately detailed program being posted in the form of bulletins at headquarters each afternoon for the succeeding day and issued in printed form the following morning.

The Committee plans to include in the clinical program many special features, among them being: (1) Fracture clinics at which modern methods in the treatment of fractures will be demonstrated; (2) cancer clinics demonstrating the treatment of cancer by surgery, radium, and X-ray; (3) clinics in traumatic surgery for the presentation of methods of rehabilitation of injured patients by surgery and physiotherapy.

CANCER SYMPOSIUM

On Wednesday afternoon in the ballroom of the Copley-Plaza Hotel a symposium on cancer will be presented under the auspices of the College Committee on the Treatment of Malignant Diseases. This will include further reports by clinicians from various parts of the United States and Canada presenting additional statistics on the cure of cancer in addition to reports presented at the 1932 and 1933 sessions of the Clinical Congress.

CHARLES A. DUKES, Oakland, Calif., Presiding.
General Subject of Curability of Cancer: FRANKLIN H. MARTIN, Director-General.
General Cases of Five Year Cures: ROBERT S. CATHCART, Charleston, S. C.; ROY D. MCCLURE and ARTHUR MCGRAW, Detroit; MONT R. REID and WILLIAM MILLAR, Cincinnati; FRANCIS CARTER WOOD and BENJAMIN RICE SHORE, New York.
Cancer of the Pelvic Organs and Breast: FREDERICK C. HOLDEN, New York; C. JEFF MILLER, New Orleans.
Cancer of the Breast: HUBERT A. ROYSTER, Raleigh, N. C.; HUGH H. TROUT, Roanoke, Va.
Cancer of the Pelvic Organs: FREDERICK J. TAUSSIG, St. Louis.
Cancer of the Genito-Urinary Organs: EDWIN BEER, New York.
Cancer of the Mouth and Larynx: GORDON B. NEW, Rochester, Minn.
Lymphatic Tumors: LLOYD F. CRAVER, New York.

Following these reports a group of papers descriptive of accepted methods for the treatment of cancer will be presented as follows:

Cancer of the Stomach Treated by Surgery. J. SHELTON HORSLEY, Richmond, Va.
Cancer of the Cervix Treated by Surgery and Irradiation. GEORGE GRAY WARD, New York.
Cancer of the Breast Treated by Surgery and Irradiation. STUART W. HARRINGTON, Rochester, Minn.

Cancer of the Lip Treated by Surgery and Irradiation. ELLIS FISCHEL, St. Louis.
Cancer of the Bladder Treated by Surgery and Irradiation. WILLIAM E. LOWER, Cleveland.

FRACTURE CONFERENCE

A conference on fractures, under the auspices of the College Committee on the Treatment of Fractures, will be held in the ballroom of the Copley-Plaza Hotel on Tuesday afternoon.

Among the papers to be presented are the following:

One Thousand Consecutive Fractures of Both Bones of the Leg. WILLIAM SENGER in collaboration with J. SIMS NORMAN, Pueblo, Colo.
Treatment of Fracture of the Carpal Scaphoid. D. W. GORDON MURRAY, Toronto.
Fractures of the Jaw. ROBERT H. IVY, Philadelphia.
Acute Fractures. MELVIN S. HENDERSON, Rochester, Minn.

Also, under the auspices of the same committee, demonstrations of approved methods of treating fractures will be conducted daily as a part of the scientific exhibition in the Statler Hotel ballroom.

OTHER FEATURES OF THE PROGRAM

A conference under the auspices of the Board on Industrial Medicine and Traumatic Surgery is planned for Friday afternoon in the ballroom of the Copley-Plaza Hotel. The College is continuing its investigations and surveys in the industrial areas to ascertain the facts as to present medical conditions in industry and to inform employers of adequate methods of organization and administration. A further report on such surveys will be made at this conference.

Surgical motion picture films, both sound and silent, will be exhibited daily in the Georgian Room at the Statler Hotel. Many new films will be shown. The showing of films demonstrating clinical features of interest has met with popular acceptance in recent years and will be continued at this session with an enlarged program.

Ether Day will be celebrated at the Massachusetts General Hospital on Tuesday with special exercises at 4 p.m. in the dome room of the old building of the hospital where ether was first administered for the production of surgical anæsthesia on October 16, 1846.

EVENING MEETINGS

Programs for five evening sessions, as prepared by the Central Executive Committee, will be found in the following pages. At the presidential meeting on Monday evening, in Symphony Hall, the president-elect, Dr. Robert B. Greenough, of Boston, will deliver his inaugural address. On that occasion a number of distinguished surgeons from abroad who will be in attendance at the Clinical Congress will be introduced. Among the visiting surgeons will be the following: Prof. John Fraser, Edinburgh, Scotland; Dr. Bethel Solomons, Dublin, Ireland; Sir Harold Gillies and Mr. A. Lawrence Abel, London, England; Mr. Harry Platt and Dr. William F. Shaw, Manchester, England; Dr. Alexander MacLennan, Glasgow, Scotland; Dr. Rafael Silva, Mexico City, Mexico; Prof. Josef Halban, Vienna, Austria. A feature of this session will be the John B. Murphy oration in surgery by Dr. Donald C. Balfour.

Sessions on Tuesday, Wednesday, and Thursday evenings will be held in the ballroom of the Copley-Plaza Hotel at which eminent surgeons of the United States and Canada, together with visiting surgeons from foreign countries, will present papers on surgical subjects of timely importance.

The annual Convocation of the College will be held on Friday evening in Symphony Hall at which the 1934 class of candidates will be received into Fellowship in the College.

OPHTHALMOLOGY AND OTOLARYNGOLOGY

The committee in charge of the section on surgery of the eye, ear, nose, and throat has arranged a program of ophthalmological and otolaryngological clinics and demonstrations at the hospitals and medical schools. This appears in the following pages, and in addition programs for sessions on Tuesday, Wednesday, Thursday, and Friday afternoons in John Hancock Hall, located on St. James Avenue midway between the Statler and Copley-Plaza Hotels. At these sessions distinguished specialists will present papers on subjects of timely interest.

A symposium on "Diseases of the Œsophagus" will be presented on Thursday afternoon at 3:30 in the ballroom of the Copley-Plaza Hotel following the annual meeting. The program follows:

An X-ray Study on Lesions of the Œsophagus (statistical study with lantern slides). A. S. MACMILLAN.
Infection of the Œsophagus in Acute and Chronic Disease; Fibrosis of the Terminal Portion of the Œsophagus (Cardiospasm), Etiology and Treatment. HARRIS P. MOSHER.
The Surgical Approach to the Œsophagus. EDWARD D. CHURCHILL.

HOSPITAL CONFERENCE

The annual Hospital Standardization Conference will open the Congress with a session in the ballroom of the Copley-Plaza Hotel at 10 o'clock on Monday morning. An interesting program of papers, round table conferences, and practical

demonstrations is being prepared for sessions to be held on Monday, Tuesday, Wednesday, and Thursday mornings at the Copley-Plaza Hotel, with afternoon sessions at several of the hospitals. In this program will be presented two problems of major concern to all hospitals—sterilization of surgical dressings, instruments, and supplies, and standards for maternal care in hospitals. Both subjects are attracting widespread interest, and various aspects will be presented by recognized authorities. In addition to the symposia ample opportunity will be afforded for round table discussions.

A greatly increased interest on the part of surgeons in both the administrative and scientific phases of hospital work has been evidenced in recent years and the program for this year's conference will be unique in providing for discussions of subjects of interest to the three major hospital groups—medical, nursing, and administrative. The College aims to make this year's program of wide interest and practical character through a careful selection of subjects to be presented and discussed by surgeons and hospital executives, particular emphasis being directed toward professional standards and the vital problems related to medical economics.

HEADQUARTERS

The Statler and Copley-Plaza Hotels will be utilized as headquarters for the Congress. At the former, the grand ballroom and adjoining assembly room together with other large rooms on the mezzanine floor have been reserved for the exclusive use of the Congress for registration and clinic ticket bureaus, bulletin boards, technical exhibition, and executive offices. A scientific exhibit, which will be arranged by the local committee, is to be installed in the balcony of the ballroom. At the Copley-Plaza Hotel the grand ballroom will be utilized for evening scientific meetings, hospital conferences, and other large gatherings daily.

The technical exhibition will be located in the ballroom and adjoining assembly room at the Statler Hotel. The registration and clinic ticket desk, together with the information bureau, will be located in these rooms in which will also be found the bulletin boards on which the daily clinical programs will be posted each afternoon. The leading manufacturers of surgical instruments, X-ray apparatus, operating room lights, hospital apparatus and supplies of all kinds, ligatures, dressings, pharmaceuticals, and publishers of medical books will be represented in this exhibition.

ADVANCE REGISTRATION

The hospitals and medical schools of Boston afford accommodations for a large number of visiting surgeons, but to insure against overcrowding, attendance at the Congress will be limited to a number that can be comfortably accommodated at the clinics—the limit of attendance being based upon the result of a survey of the amphitheaters, operating rooms, and laboratories of the hospitals and medical schools to determine their capacity for visitors. It is expected, therefore, that those surgeons who wish to attend the Clinical Congress in Boston will register in advance.

Admittance to all clinics and demonstrations will be controlled by means of special clinic tickets, which plan provides an efficient means for the distribution of the visiting surgeons among the several clinics and insures against overcrowding, as the number of tickets issued for any clinic will be limited to the capacity of the room in which that clinic will be given.

A registration fee of $5.00 is required of each surgeon attending the annual Clinical Congress, such fees providing the funds with which to meet the expenses of the meeting. To each surgeon registering in advance a formal receipt for the registration fee is issued, which receipt is to be exchanged for a general admission card upon his registration at headquarters. This card, which is non-transferable, must be presented in order to secure clinic tickets and admission to the evening meetings.

REDUCED RAILWAY FARES

The railways of the United States and Canada have authorized reduced fares on account of the Boston session of the Clinical Congress so that the total fare for the round trip will be one and one-third the ordinary first-class one-way fare. To take advantage of the reduced rates it is necessary to pay the full one-way fare to Boston, procuring from the ticket agent when purchasing ticket, a "convention certificate," which certificate is to be presented at headquarters for the signature of the general manager of the Clinical Congress and the visé of a special agent of the railways. Upon presentation of the viséd certificate to the ticket agent in Boston not later than October 23, a ticket for the return journey by the same route as traveled to Boston may be purchased at one-third the one-way fare.

In the eastern, central, and southern states and eastern provinces of Canada tickets may be purchased between October 11 and 16; in other sections of the United States and Canada at earlier

dates. The return journey must be completed within thirty days from date of sale of ticket to Boston.

The reduction in fares does not apply to Pullman fares nor to extra fares charged for passage on certain trains. Local railroad ticket agents will supply detailed information with regard to dates of sale, routes, etc. Stop-overs on both the going and return journeys may be had within certain limits.

Full fare must be paid from starting point to Boston, and it is essential that a "convention certificate" be obtained from the agent when the ticket is purchased. These certificates are to be signed by the general manager of the Clinical Congress and viséd by a special railroad agent at Clinical Congress headquarters on or before October 19. No reduction in railroad fares can be secured except in compliance with the regulations outlined and within the dates specified. It is important to note that the return trip must be made by the same route as used in going to Boston, that the certificate must be viséd at headquarters during the meeting, and return ticket purchased not later than October 23.

In the western and southwestern states, including the Pacific coast states and the western provinces of Canada, the railroads have authorized the sale of round trip tickets to Chicago at very low rates on account of A Century of Progress Exposition, so that persons from the west traveling through Chicago to Boston will find it to their advantage to buy round trip tickets to Chicago at the low rates in effect on account of the Exposition. Under this plan it will be necessary to purchase tickets to Boston from Chicago taking advantage of the "convention certificate" plan outlined above. Ticket agents should be consulted with regard to special rates.

BOSTON HOTELS AND RATES

Boston hotels will provide ample facilities and there should be no difficulty in securing first-class accommodations. It is advisable, however, for those who expect to attend the Clinical Congress to reserve their accommodations as far in advance as possible. In addition to the headquarters hotels, the Statler and Copley-Plaza, there are a number of first-class hotels within walking distance of headquarters. The following list of hotels with their rates has been prepared by the local committee:

	Minimum Rates with bath	
	Single	Double
Bellevue, 21 Beacon Street	$3.00	$5.00
Bradford, 275 Tremont Street	2.50	3.50
Braemore, 464 Commonwealth Avenue	3.00	4.00
Brunswick, 520 Boylston Street	2.50	4.00
Buckminster, 645 Beacon Street	2.00	3.50
Canterbury, 14 Charlesgate West	2.50	3.00
Charlesgate, 535 Beacon Street		4.00
Copley-Plaza, 138 St. James Avenue	4.00	6.00
Fensgate, 534 Beacon Street	2.50	3.50
Graylyn, 20 Charlesgate West		5.00
Hemenway, 91 Westland Avenue	2.50	3.50
Kenmore, 490 Commonwealth Avenue	3.00	4.50
Lenox, Exeter Street	2.50	3.50
Lincolnshire, 20 Charles Street	3.00	4.50
Manger, North Station	2.50	3.50
Parker House, 60 School Street	3.00	4.50
Puritan, 390 Commonwealth Avenue	3.50	5.00
Ritz-Carlton, 15 Arlington Street	4.00	7.00
Sheraton, 91 Bay State Road	3.00	4.00
Somerset, 400 Commonwealth Avenue	3.00	3.50
Statler, Park Square	3.50	5.00
Touraine, 62 Boylston Street	3.00	5.00
Vendome, 160 Commonwealth Avenue	2.50	4.00
Victoria, 271 Dartmouth Street	3.00	5.00
Westminster, 124 St. James Avenue	2.50	3.50

PRELIMINARY PROGRAM FOR EVENING MEETINGS

Presidential Meeting—Monday—October 15, 8:15 p.m.

Address of Welcome: ARTHUR W. ALLEN, M.D., Boston, Chairman, Committee on Arrangements

Introduction of Foreign Guests: FRANKLIN H. MARTIN, M.D., Chicago, Director-General

Address of Retiring President: WILLIAM D. HAGGARD, M.D., Nashville, Tenn.

Inauguration of Officers

Inaugural Address. ROBERT B. GREENOUGH, M.D., Boston

John B. Murphy Oration in Surgery. DONALD C. BALFOUR, M.D., Rochester, Minn.

Tuesday—October 16, 8:15 p.m.

Living Grafts of Thyroid and Parathyroid Glands. HARVEY B. STONE, M.D., Baltimore, with the collaboration of JAMES C. OWINGS, M.D., and GEORGE O. GUY, M.D., Baltimore

Endocrine Mechanisms in Certain Functional Gynecological Disorders. EMIL NOVAK, M.D., Baltimore

Skeletal Lipoid Granulomatosis. JOHN FRASER, M.D., Ch.M., F.R.C.S. (Edin.), Edinburgh, Scotland

Fracture Oration. KELLOGG SPEED, M.D., Chicago

Wednesday—October 17, 8:15 p.m.

Hydrocephalus and Spina Bifida. WILDER PENFIELD, M.D., Montreal

Sterility with Special Reference to Surgical Possibilities. BETHEL SOLOMONS, M.D., F.R.C.P.I., Dublin, Ireland

Diverticulosis and Diverticulitis. IRVIN ABELL, M.D., Louisville

Thursday—October 18, 8:15 p.m.

Symposium on Treatment of Infections:

Infections of Clean Operative Wounds. FRANK L. MELENEY, M.D., New York

Infections of the Lip and Face. FREDERICK A. COLLER, M.D., Ann Arbor, Mich.

Phagedenic Ulcer; its Recognition and Treatment. EMILE HOLMAN, M.D., San Francisco

The Repair of Defects Resulting from Full Thickness Loss of Skin from Burns. JAMES B. BROWN, M.D., St. Louis

Convocation—Friday—October 19, 8:15 p.m.

Invocation

Presentation of Candidates for Fellowship. FRANKLIN H. MARTIN, M.D., Chicago, Director-General

Conferring of Fellowships. The President

Conferring of Honorary Fellowships. The President

Presidential Address. ROBERT B. GREENOUGH, M.D., Boston

Fellowship Address

OPHTHALMOLOGY AND OTOLARYNGOLOGY—SCIENTIFIC SESSIONS

Tuesday—John Hancock Hall, 2—Ophthalmology

JOHN M. WHEELER, New York. Plastic ophthalmic surgery. Discussion opened by W. B. LANCASTER.

JONAS S. FRIEDENWALD, Baltimore. Slit lamp ophthalmoscopy. Discussion opened by J. H. WAITE.

CLARENCE KING, Cincinnati. Tuberculin in the treatment of ocular tuberculosis. Discussion opened by MERRILL KING.

RAFAEL SILVA, Mexico City. Subject to be announced.

Wednesday—John Hancock Hall, 2—Otolaryngology

THOMAS E. CARMODY, Denver. Congenital deformities of the face and neck. Discussion opened by V. H. KAZANJIAN.

LOUIS H. CLERF, Philadelphia. Peroral endoscopy in otolaryngological practice.

SAMUEL J. CROWE, Baltimore. Ménière's symptom complex. Discussion opened by PHILIP MELTZER.

JOHN R. PAGE, New York. Acute infections of the middle ear and mastoid.

O. JASON DIXON, Kansas City. A departure in the management of acute mastoid disease or the advantages of conservative treatment in acute mastoid disease. Discussion opened by LYMAN RICHARDS.

GEORGE M. COATES, Philadelphia. Diagnosis of chronic infection of the tonsils in relation to indications for operation in cases of chronic focal infection.

WILLIAM V. MULLIN, Cleveland. Present status of infection of the upper respiratory tract in its relation to focal infection. Discussion opened by H. ARCHIBALD NISSEN.

EDWARD ZEIGELMAN, San Francisco. The clinical and surgical significance of the component cellular characteristics of the temporal bone, based upon a series of 100 cadaver and autopsy observations, lantern slide demonstration.

Thursday—John Hancock Hall, 2—Ophthalmology

LUTHER C. PETER, Philadelphia. The technique of orthoptic training in strabismus. Discussion opened by DAVID MILLS.

HARRY S. GRADLE, Chicago. Recent therapeutic procedures. Discussion opened by ALLEN GREENWOOD.

WILLIAM L. BENEDICT, Rochester, Minn. Subject to be announced. Discussion by W. MILLBROOK LOWEL.

C. N. SPRATT, Minneapolis. Closure of the cataract incision (motion pictures).

Ballroom, Copley-Plaza Hotel—3:30—Otolaryngology

A. S. MACMILLAN. An X-ray Study on Lesions of the Œsophagus (statistical study with lantern slides).

HARRIS P. MOSHER. Infection of the Œsophagus in Acute and Chronic Disease; Fibrosis of the Terminal Portion (Cardiospasm), Etiology and Treatment.

EDWARD D. CHURCHILL. The Surgical Approach to the Œsophagus.

Friday—John Hancock Hall, 2—Otolaryngology

SAMUEL J. KOPETZKY, New York. Recent developments in the diagnosis of meningitis.

WELLS P. EAGLETON, Newark, N. J. Meningitis—result of disease of the petrous apex and sphenoidal basis.

MARVIN F. JONES, New York. Pathways of approach to the petrous pyramid. Discussion by HARRY P. CAHILL.

WILLIAM MITHOEFER, Cincinnati. When and how shall a nasal sinus inflammation be treated nonsurgically?

EDWARD C. SEWELL, San Francisco. Operative treatment of sinusitis, external approach. Discussion opened by CHARLES T. PORTER.

GABRIEL TUCKER, Philadelphia. Cancer of the larynx.

HENRY B. ORTON, Newark, N. J. Cancer of the laryngopharynx. Discussion opened by LEROY A. SCHALL.

PRELIMINARY CLINICAL PROGRAM

GENERAL SURGERY, GYNECOLOGY, OBSTETRICS, ORTHOPEDICS, UROLOGY, PROCTOLOGY, SURGICAL PATHOLOGY, ETC.

CHILDREN'S HOSPITAL

Monday

W. E. LADD and associates—2. Fractures in children. W. E. LADD: Elbow fractures. T. H. LANMAN: Fractures of the femur. P. J. MAHONEY: Fractures of both bones of the forearm.

Tuesday

F. R. OBER and associates—9. Orthopedic operations.
W. E. LADD—9:30. Plastic repair of harelip and cleft palate, demonstration of cases, motion picture demonstration.
THOMAS H. LANMAN—10. Acute osteomyelitis in infancy and childhood.
PATRICK J. MAHONEY—10:30. The use of various types of skin grafts in children's surgery.
HENRY HUDSON, JR.—11. Acute appendicitis in childhood; Meckel's diverticulum.
Staff—2. Operative clinic, surgery in infants and children.
Staff—2. Orthopedic clinic. A. T. LEGG: Early treatment and the prevention of deformities in poliomyelitis. F. R. OBER: Shoulder operations. J. W. SEVER: Stabilization of the ankle joint. M. KATZEFF: Tendon transplants. A. T. LEGG: Abductor limp.

Wednesday

F. R. OBER and associates—9. Orthopedic clinic at Peabody Home.
Staff—9:30. Operative clinic.
W. E. LADD—2. Congenital hypertrophic pyloric stenosis; intussusception, diagnosis and treatment.
DONALD W. MACCOLLUM—2:30. Treatment of undescended testes, end-results over a 34 year period.
THOMAS H. LANMAN—3. Chronic pulmonary suppuration, demonstration of cases.
HENRY HUDSON, JR.—3:15. Empyema in childhood, its treatment.
SIDNEY FARBER—3:30. Surgical pathology of malignant tumors in infancy and childhood, followed by demonstration of pathological specimens in department of pathology.
EDWARD C. VOGT—3:45. Roentgenological studies of unusual bone tumors in infancy and childhood.

Thursday

F. R. OBER and associates—9. Orthopedic operations.
W. E. LADD—9:30. Intestinal atresia, diagnosis and treatment, demonstration of cases, lantern slides.
PATRICK J. MAHONEY—10. Types of tracheo-œsophageal fistulæ; differential diagnosis and operative treatment; congenital and acquired œsophageal stricture, demonstration of methods of dilatation.
W. E. LADD—10:30. Atresia of the bile ducts, diagnosis and treatment; choleductus cyst, diagnosis and treatment.
THOMAS H. LANMAN—11. Ureteral transplantation for exstrophy of the bladder, demonstration of treated cases.
Staff—2. Operative clinic, surgery in infants and children.
Staff—2. Orthopedic dry clinic. A. H. BREWSTER: Claw feet. F. H. MORRIS: Torticollis, mastoid approach. H. FITZSIMMONS: Discussion. F. R. OBER: Semilunar cartilage. H. FITZSIMMONS: Osteoclasis. R. H. MORRIS: Club feet.

Friday

Staff—9. Orthopedic clinic. S. M. FITCHET: Cleidocranial dysostosis. F. R. OBER: Shelf operations; Sprengel's deformity. S. M. FITCHET: Flexion deformity of the hips. A. T. LEGG: Coxa plana. J. W. SEVER: Obstetrical paralysis.
Staff—9:30. Operative clinic, surgery in infants and children.
W. E. LADD—2. Ulcerative colitis in childhood—diagnosis and treatment; demonstration of cases, lantern slide demonstration.
PATRICK J. MAHONEY—2:30. Treatment of fresh burns.
DONALD W. MACCOLLUM—2:45. Treatment of hæmangioma by endothermy, demonstration of cases.
W. E. LADD—3. Surgical significance of pyuria in infancy and childhood, demonstration of cases, lantern slide demonstration.
T. H. LANMAN—3:30. Malignant bladder tumors in childhood.

PETER BENT BRIGHAM HOSPITAL

Monday

DAVID CHEEVER—2. Surgical clinic.
H. F. NEWTON—3. Thoracoplasty.
S. A. LEVINE—3:30. Circulatory emergencies in surgical patients.

Tuesday

Staff—9. General surgery, operative clinic.
E. C. CUTLER—2. Total thyroidectomy.
C. L. DERICK—3. Symptoms and diagnosis of vascular thrombosis.
JOHN HOMANS—3:30. Swollen legs.

Wednesday

Staff—9. General surgery, operative clinic.
HENRY A. CHRISTIAN—2. Medical clinic.
M. C. SOSMAN—3. Recent developments in diagnostic radiology.
E. S. EMERY, JR.—3:30. Results of surgical procedures for relief of peptic ulcer.

Thursday

Staff—9. General surgery, operative clinic.
W. C. QUINBY—2. Indications for and results of total cystectomy.
J. C. ECKELS and G. P. GRABFIELD—2:30. Denervated kidney, studied by means of the divided bladder.
M. S. STROCK—3. Methods of fixation of fractures of the jaw.
S. B. WOLBACH—3:30. Demonstration of surgical pathology.

Friday

Staff—9. General surgery, operative clinic.
DAVID CHEEVER—2. Cancer of the stomach.
F. C. NEWTON—2:30. Cancer of the rectum.
R. FITZ—3. Function of the spleen.
W. P. MURPHY—3:30. Treatment of pernicious anæmia, motion picture demonstration.
F. R. OBER—3:45. Treatment of neuromuscular sequelæ of pernicious anæmia.

BOSTON CITY HOSPITAL

Monday

Staff—2. Dry clinic. J. J. REGAN, S. WEISS, and D. MUNRO: The eye in arteriosclerosis, hypertension and tumor. G. K. COONSE: Treatment of shock. J. RESNIK and M. RITVO: Pellegrini-Steida's disease, diagnosis and treatment. O. J. HERMANN and E. PARKER, JR.: Synovioma of knee. F. A. SLOWICK: Septic hips.

Tuesday

DAVID D. SCANNELL, SOMERS FRASER, THOMAS W. WICKHAM, and JOHN A. SETH—9. General surgical dry clinic.

First surgical service—9. General surgical operative clinic. HORACE BINNEY: Thoracoplasty for unilateral phthisis; phrenicectomy for unilateral phthisis. JAMES J. HEPBURN: Repair of ventral hernia; gastric ulcer. GEORGE W. PAPEN: Chronic empyema; cholecystitis.

Fifth surgical service—2. Dry clinic. IRVING J. WALKER: Some surgical aspects of jaundice—hyperparathyroidism, end-results; repair of common duct; chondrosarcoma of humerus, end-result; carcinoma of stomach, end-result; ligation of common carotid artery, end-result. FRANCIS F. HENDERSON: Carcinoma of lung; pancreatitis, review of sixty cases. AUGUSTUS RILEY: Prostate and vesicles as foci for retroperitoneal infection; kidney resections; demonstration of cases. CHARLES C. LUND: Peripheral arterial embolism, results of operative treatment on fifteen cases. E. EVERETT O'NEIL: Breast tumors, clinical versus X-ray diagnosis. WILLIAM A. WHITE: Subject to be announced.

ROBERT M. GREEN, JOHN T. WILLIAMS, FREDERICK L. GOOD, JOSEPH P. COHEN, and associates—2. Gynecological and obstetrical dry clinic: Treatment of miscarriages; puerperal sepsis; pelvic inflammation.

Wednesday

IRVING J. WALKER, FRANCIS F. HENDERSON, CHARLES C. LUND, E. EVERETT O'NEIL, and WILLIAM A. WHITE—9. General surgery, operative clinic.

Bone and joint service—9. Dry clinic. OTTO J. HERMANN: Boston City Hospital bone and joint service. THOMAS H. PETERSON: Colles' fracture therapy; Soutter traction in unreduced fractures of the forearm and old shoulder dislocations. GEORGE K. COONSE: Fracture of the olecranon, new operative repair. OTTO J. HERMANN: Recurrent shoulder dislocations repaired by the Nicola method, end-results, discussion. WILLIAM F. COTTING and MARK H. ROGERS: Subdeltoid bursitis. MARK H. ROGERS: Rupture of supraspinatus tendon, discussion. JOSEPH H. SHORTELL: Spinal fracture, therapy. RUSSELL F. SULLIVAN: Spinal fusions. OTTO J. HERMANN: Compound fracture therapy. FRANK W. MARVIN: Anæsthesia in fractures.

First surgical service—2. Dry clinic. NEWTON C. BROWDER: Results of treatment of Colles' fracture; modern splinting methods in fracture therapy. JAMES J. HEPBURN: Results in treatment of peptic ulcer; giant-cell sarcoma of bone; treatment of ventral hernia. HORACE BINNEY: Methods and results in treatment of acute empyema, lung abscess, bronchiectasis, pulmonary tuberculosis. GEORGE W. PAPEN: Methods and results in treatment of chronic empyema.

Sixth surgical service—2. Dry clinic. JAMES W. SEVER: Separation of femoral epiphysis. MARK H. ROGERS: Ankylosed hips. OTTO J. HERMANN: Treatment of intracapsular fractures of neck of femur, demonstration of cases of recent fractures and ununited fractures. FREDERIC J. COTTON: Pelvic fractures. JOSEPH H. SHORTELL: Bone grafting.

ROBERT M. GREEN, JOHN B. WILLIAMS, FREDERICK L. GOOD, JOSEPH P. COHEN, and associates—9. Gynecological and obstetrical operations.

Thursday

OTTO J. HERMANN, JOSEPH H. SHORTELL, WILLIAM F. COTTING, RUSSELL F. SULLIVAN, THOMAS H. PETERSON, and G. KENNETH COONSE—9. Operative bone and joint clinic. Ward rounds, demonstration of fracture apparatus, etc.

Second surgical service—9. ROBERT C. COCHRANE: Total thyroidectomy for congestive failure and angina; parathyroid tumors. WILLIAM R. MORRISON: One hundred perforated ulcers of the stomach and duodenum from the Boston City Hospital; stomach surgery, motion picture demonstration; demonstration of following cases—total removal of stomach for cancer with anastomosis of the jejunum to the œsophagus, hour-glass deformity of the stomach, cholecystgastrotomy formed by nature. THOMAS K. RICHARDS: Knee-joint pathology. JOHN J. LUCY: Recurrent intussusception caused by intestinal tumor; carcinoma of the sigmoid. RICHARD I. SMITH: Pancreatitis. HERBERT H. HOWARD: End-results of bilateral renal tuberculosis; importance of postoperative treatment of prostatectomized patient.

Fourth surgical service—2. Dry clinic. ARTHUR R. KIMPTON: Civilian gas gangrene; tetanus; use of amniotic liquid concentrate; cavernous hæmangioma of neck; catheter in common bile duct since 1926; ununited fractures. EDWARD HARDING: Demonstration of cases. JOSEPH H. BURNETT: Colles' fracture therapy. H. A. BOUVÉ: Acute traumatic abdomen.

Sixth surgical service—2. Bone and joint dry clinic. WILLIAM F. COTTING: Gonorrhœal arthritis of the knee. RUSSELL F. SULLIVAN: Hallux valgus therapy. OTTO J. HERMANN: Fractures of the os calcis therapy, discussion. JOSEPH H. SHORTELL: Bone tumors. FREDERICK W. O'BRIEN: Pre- and postoperative X-ray therapy in malignant tumors of the bone. THOMAS H. PETERSON: "Fender" fractures.

ROBERT M. GREEN, JOHN B. WILLIAMS, FREDERICK L. GOOD, JOSEPH P. COHEN, and associates—9. Obstetrical and gynecological operations.

Friday

ARTHUR R. KIMPTON, ROBERT C. COCHRANE, WILLIAM R MORRISON, STEPHEN P. MALLETT, and V. H. KAZANJIAN—9. General surgery, operative clinic.

Staff—9. Gynecological and obstetrical operations.

Staff—2. Dry clinic. J. J. REGAN and W. B. CASTLE: The eye in anæmic patients. STEPHEN P. MALLETT: Fractures of the jaw. WILLIAM R. MORRISON: Visualization of arteries and veins for diagnosis and operation of aneurysm; ligation of the first part of right subclavian artery and subsequent ligation of innominate artery for arteriovenous aneurysm of internal jugular vein and subclavian artery. OTTO J. HERMANN and WILLIAM R. MORRISON: Chronic subluxation of sternal end of clavicle. STEPHEN J. MADDOCK: Discussion of the Baer maggot treatment of chronic osteomyelitis.

Physiotherapy service—9. Dry clinic. JOSEPH RESNIK: Electrodiagnosis. JOSEPH RESNIK, GIRDIE W. DICKINSON, ARTHUR J. COLE, WALDO W. ROBBINS, and SIDNEY M. SIMONS: Demonstration of cases and treatment.

MASSACHUSETTS GENERAL HOSPITAL

Monday

Staff—2. Dry clinic. A. W. ALLEN: Bleeding peptic ulcer. JOHN STEWART: Water balance in the surgical patient. C. M. JONES: Nutritional œdema. L. S. MCKITTRICK: Cancer of rectum. E. L. YOUNG, JR.: Cancer of colon. J. V. MEIGS and F. W. HOYT: Rupture of Graafian follicle and corpus luteum. R. H. WALLACE: Treatment of burns.

W. J. MIXTER, JOHN HODGSON, and associates—2. Neurosurgical clinic.

V. H. KAZANJIAN, E. M. DALAND, and associates—2. Plastic surgery clinic.

T. R. GOETHALS and associates—4. Obstetrical clinic.

Tuesday

Staff—9. Operative clinics. General surgical, genito-urinary, and thyroid services.

H. C. MARBLE and T. W. HARMER—2. Hand lesions.

GEORGE HOLMES, A. O. HAMPTON, and associates—2. Symposium on the roentgen ray.

E. D. CHURCHILL and associates—2. Surgical research laboratories, demonstration of specimens and discussions.

M. N. SMITH-PETERSEN and associates—2. Orthopedic clinic.

Ether Day exercises—4.

Wednesday

Staff—9. Operative clinics, general surgical, fracture and circulatory services.

Staff—2. Dry clinic. D. KING: Postoperative pulmonary complications. H. BRADSHAW: Methods in anæsthesia. H. SPRAGUE: Surgery in cardiac patients. L. S. MCKITTRICK and R. H. MILLER: Ulcerative colitis. E. D. CHURCHILL: Cardiolysis. E. B. BENEDICT: Gastroscopy. R. H. MILLER: Osteomyelitis.

J. V. MEIGS, F. ALLBRIGHT, and associates—2. Ovarian dysfunction clinic.

P. D. WILSON, A. W. ALLEN, G. A. LELAND, and associates—2. Fracture clinic.

Thursday

E. A. CODMAN and associates—9. Symposium on lesions of the shoulder.

Staff—9. Operative clinics, general surgical and thoracic services.

T. B. MALLORY—12. Clinical pathological conference.

E. D. CHURCHILL, W. WHITTEMORE, and associates—2. Thoracic surgery clinic.

A. W. ALLEN and associates—2. Circulatory diseases clinic.

C. C. SIMMONS and associates—2. Tumor clinic; cancer symposium.

Friday

Staff—9. Operative clinics, general surgical and orthopedic services, neurological operations; plastic surgery.

Staff—2. Dry clinic. C. LYONS: Symbiotic infections. B. VINCENT and A. V. BOCK: Surgery of spleen. A. W. ALLEN: Regional ileitis. R. H. MILLER: Tuberculosis of the lymphatic system. R. LINTON: Portal circulation. R. H. SMITHWICK: Significance of negative Graham tests. OLIVER COPE: Subject to be announced. R. ROGERS: Pilonidal sinus.

J. H. MEANS, A. W. ALLEN, E. D. CHURCHILL, R. H. MILLER, E. L. YOUNG, JR., and associates—2. Diseases of the thyroid and parathyroid.

J. D. BARNEY and associates—2. Genito-urinary surgery.

FREE HOSPITAL FOR WOMEN

Tuesday

F. A. PEMBERTON, G. V. SMITH, and S. C. GRAVES—9. Operative and dry clinic: Carcinoma of cervix uteri, treatment and results, prevention, diagnosis of early cases, relation to cervicitis and its treatment, complications of radium treatment, relief of pain; carcinoma of fundus uteri, treatment and results, classification; other tumors of uterus—fibroids, adenomyoma.

Wednesday

F. A. PEMBERTON, G. V. SMITH, and PAUL YOUNGE—9. Operative and dry clinic: Tumors of the ovary, diagnosis, treatment, and results. Cystadenoma, granulosa cell tumor, Brenner tumor, teratoma; endometriosis, diagnosis and treatment; tumors of tubes, round ligaments, and vagina.

Thursday

G. V. SMITH and JOHN ROCK—9. Operative and dry clinic: Sterility, diagnosis, treatment and results; menorrhagia and metrorrhagia, diagnosis, treatment and results; endocrine research; dysmenorrhœa.

Friday

F. A. PEMBERTON, E. B. SHEEHAN, and S. C. GRAVES—9. Operative and dry clinic: Prolapse, procidentia; complete tear of perineum; vesico- and rectovaginal fistulæ; kraurosis vulvæ, carcinoma vulvæ; Trichomonas vaginale; tumors of breast, value of X-ray treatment.

COLLIS P. HUNTINGTON MEMORIAL HOSPITAL

Monday

Staff—2:15. Tumors and diseases of bones, dry clinic. J. C. AUB: Calcium metabolism in diseases of the bones. CHANNING C. SIMMONS: Malignant tumors of bone. RICHARD DRESSER: Radiological diagnosis of bone tumors and certain rare forms of skeletal diseases. C. C. FRANSEEN: The phosphatase content of the blood in bone tumors and skeletal diseases.

GEORGE A. LELAND and J. V. MEIGS—3:30. Carcinoma of the cervix.

Friday

Staff—2:15. Carcinoma of the oral mucous membrane, dry clinic. CHANNING C. SIMMONS: Choice of treatment in the individual case. C. C. LUND: Results of treatment of cancer of lip. GRANTLEY W. TAYLOR: Carcinoma of the mouth in the female. RICHARD DRESSER: Radiation treatment of oral carcinoma. CHARLES B. HOPKINS: Prophylaxis of cancer of the mouth. SOMERS STURGIS: Electrical currents between fillings of different metals as an etiological factor in leucoplakia and carcinoma of the mouth.

E. W. HERMAN and LEROY A. SCHALL—3:30. Carcinoma of the accessory sinuses, tonsils, and larynx.

CAMBRIDGE HOSPITAL

Tuesday

Staff—9. General surgical clinic.

Staff—2. General surgery, dry clinic.

Wednesday

J. W. SEVER, S. S. HANFLIG, and M. G. KATZEFF—9. Fracture clinic.

V. H. KAZANJIAN—9. Corrective fracture clinic.

Staff—2. Fractures, dry clinic.

NEW ENGLAND DEACONESS HOSPITAL

Tuesday

F. H. LAHEY, H. M. CLUTE, R. B. CATTELL, and R. H. OVERHOLT—9. General surgical operations.
GILBERT HORRAX and JAMES POPPEN—9. Neurosurgical operations.
RICHARD H. OVERHOLT—9. Thoracic surgery operations.
G. E. HAGGART—9. Orthopedic operations.
JAMES B. HICKS—9. Urological operations.
LINCOLN F. SISE, PHILIP E. WOODBRIDGE, and URBAN EVERSOLE—9. Anæsthesia.
F. H. LAHEY—9. Œsophageal diverticulum, dry clinic.
GILBERT HORRAX—9. Malignant exophthalmos, dry clinic.
Staff—2. Dry clinics. H. M. CLUTE: Management of obstructive jaundice; exploration of common duct. GILBERT HORRAX: Brain tumors; malignant exophthalmos. SARA M. JORDAN: Gastric cancer and ulcer; gastrojejunal ulcer. F. H. LAHEY: Total gastrectomy for cancer; gastrojejunal colic fistula; surgery of intractable ulcer. EVERETT KIEFER: Hæmorrhage in peptic ulcer. RICHARD B. CATTELL: Embolectomy; parathyroid tetany.

Wednesday

F. H. LAHEY, H. M. CLUTE, R. B. CATTELL, and R. H. OVERHOLT—9. General surgical operations.
GILBERT HORRAX and JAMES POPPEN—9. Neurosurgical operations.
RICHARD H. OVERHOLT—9. Thoracic surgery operations.
G. E. HAGGART—9. Orthopedic operations.
JAMES B. HICKS—9. Urological operations.
LINCOLN F. SISE, PHILIP D. WOODBRIDGE, and URBAN EVERSOLE—9. Anæsthesia.
Staff—2. Dry clinics. G. E. HAGGART: Subdeltoid bursitis; treatment of flexion deformities. JAMES L. POPPEN: End-results in trigeminal neuralgia; spinal fluid pressure dynamics. FRANK H. LAHEY: Œsophageal diverticulum; hyperthyroidism. H. M. CLUTE: End-results in hyperthyroidism. LEWIS M. HURXTHAL: Thyrocardiac patients. EVERETT KIEFER: Ulcerative colitis. RICHARD B. CATTELL: Surgical treatment of ulcerative colitis. RICHARD OVERHOLT: Limited thoracoplasty in pulmonary tuberculosis; cancer of lung.

Thursday

E. P. JOSLIN, H. F. ROOT, L. S. MCKITTRICK, and T. C. PRATT—9. Surgical and medical diabetic ward rounds.
T. C. PRATT—10:30. Thigh amputation for diabetic gangrene.
L. S. MCKITTRICK—10:30. Gritti-Stokes amputation for diabetic gangrene.
Staff—2. Dry clinic: Surgery in diabetes mellitus. E. P JOSLIN: Medical care of the surgical patient. L. RICHARDS: Otolaryngological aspect of diabetes. J. H. WAITE: Cataract surgery in diabetes mellitus. Gangrene and infection of the lower extremities. H. F. ROOT: preventive measures. L. S. MCKITTRICK: factors influencing the level of amputation. T. C. PRATT: indications for guillotine amputation. R. S. TITIS: Obstetrics in diabetes. MARK ROGERS: Depressed fracture of the spine in diabetes; subdeltoid bursitis in diabetes mellitus.

Friday

F. H. LAHEY, H. M. CLUTE, R. B. CATTELL, and R. H. OVERHOLT—9. General surgical operations.
GILBERT HORRAX and JAMES POPPEN—9. Neurosurgical operations.
RICHARD H. OVERHOLT—9. Thoracic surgery operations.
G. E. HAGGART—9. Orthopedic operations.
JAMES B. HICKS—9. Urological operations.
LINCOLN F. SISE, PHILIP D. WOODBRIDGE, and URBAN EVERSOLE—9. Anæsthesia.
Staff—2. Dry clinics. R. B. CATTELL: Cancer of the colon and rectum. GILBERT HORRAX: Root resection for trigeminal neuralgia; cordotomy for pain. JAMES POPPEN: Spinal cord tumors. RICHARD OVERHOLT: Cancer of the breast. JAMES B. HICKS: Transurethral resection of the prostate. H. M. CLUTE: Subphrenic abscess. F. H. LAHEY and FRANK N. ALLAN: Parathyroid tumors.

PALMER MEMORIAL HOSPITAL

Tuesday

Staff—9. Treatment of malignant disease, including surgery, electrosurgery, and radium implantation, operative clinic.
Staff—2. Dry clinics. G. A. LELAND: Carcinoma of cervix. FLETCHER COLBY: Urinary tract complications from carcinoma of the cervix. L. S. MCKITTRICK: Interstitial radiation for carcinoma of the breast. R. H. DRESSER: Irradiation of the ovary in cancer of the breast. GEORGE G. SMITH: Diversion of the urinary stream. JOHN HODGSON: Relief of pain in malignant disease.

Wednesday

Staff—9. Treatment of malignant disease including surgery, electrosurgery, and radium implantation, operative clinic.

Thursday

Staff—2. Dry clinics. D. F. JONES: Surgical management of carcinoma of the rectum. L. S. MCKITTRICK: Factors favoring early diagnosis of cancer of the colon, principles of treatment. R. H. SWEET: Polyposis of the colon. SHIELDS WARREN: Pathological aspects of rectal polypi. WYMAN RICHARDSON: Blood dyscrasias after gastrectomy and short-circuiting operations on the intestinal tract.

Friday

Staff—9. Treatment of malignant disease including surgery, electrosurgery, and radium implantation, operative clinic.

PONDVILLE STATE CANCER HOSPITAL

Tuesday—2

ERNEST M. DALAND. The Massachusetts cancer program.
HENRY JACKSON, JR. Some aspects of malignant lymphoma.
JOE V. MEIGS. Ovarian tumors.
LANGDON PARSONS. Treatment of cancer of the cervix by X-ray followed by radium.
ROGER GRAVES. Cancer of the prostate with metastases.
CHARLES KICKHAM. Cancer of the penis.
CHARLES DUMAS. X-ray treatment of advanced skin cancer, demonstration of cases.

Friday—2

GRANTLEY TAYLOR. Radium needles in cancer of breast.
HORATIO ROGERS. Chronic cystic mastitis.
RICHARD DRESSER. X-ray in the diagnosis of gastro-intestinal cancer.
SHIELDS WARREN. Changes in tumor tissue caused by radiation.
JOHN HODGSON. Treatment of pain in cancer patients.
CARL ERNLUND. Cancer of the antrum, demonstration of cases.

HARVARD MEDICAL SCHOOL

Monday

G. KENNETH COONSE and OTTO AUFRANC—2 (Bldg. C). Demonstration of the mechanical factors controlling the pulmonary circulation.

CHARLES L. SCUDDER and associates—2 (Bldg. E). Symposium on fractures.

Tuesday

Building D—2

GEORGE B. WISLOCKI. Studies in mammalian reproduction.

VALY MENKIN. Some problems of inflammation related to surgery.

HENRY G. SCHWARTZ. An experimental study of sympathetic reflexes.

J. L. BREMER. The postnatal growth of the mammalian lung.

HAROLD L. WEATHERFORD. The finer changes in the liver cells in anaphylactic shock.

LESTER S. KING. Some aspects of the hæmato-encephalic barrier.

Building E—2

G. A. BENNETT and WALTER BAUER. Joint changes resulting from trauma.

HUGH K. WARD. Streptococcal infections.

CECIL K. DRINKER. The physiology of the lymphatic system and its bearing on certain problems in surgery.

Wednesday

Building C—2

HALLOWELL DAVIS. Effect of cerebral anæmia on the electrical response of the cortex.

M. I. GREGERSEN. The use of hypertonic sucrose solution to reduce cerebrospinal fluid pressure without a secondary rise.

WALTER B. CANNON. Some relations of the sympathetic nervous system to surgery.

Building B—2

DAVID CHEEVER. Surgical anatomy of the abdomen, demonstration on cadaver.

Building E—2

FRANK OBER and associates. Orthopedic problems from Children's Hospital. A. H. BREWSTER: Scoliosis. J. KUHNS: Posture and postural scoliosis. P. NORTON: Posterior transplants. H. FITZSIMMONS: Congenital deformities.

Thursday

CHARLES L. SCUDDER and associates—2 (Bldg. E). Symposium on fractures.

Friday

Symposium on Industrial Surgery—2—Building C

JOHN D. ADAMS and W. A. ROGERS. Injuries of the back.

HENRY MARBLE, F. J. COTTON, and J. D. ADAMS. Injuries of the nervous system.

F. J. COTTON and J. H. BURNETT. Colles' fracture.

Orthopedic Clinic—2—Building E

W. GREEN. Osteomyelitis in infants and children.

R. H. MORRIS. Septic hips with involved heads.

A. T. LEGG. Osteomyelitis of the tarsus.

R. JOPLIN. Multiple myeloma.

A. H. BREWSTER. Peroneal spasm.

R. H. MORRIS. Knee flexion.

Daily

Warren Museum—M. Canavan, Curator—2

Demonstration of Dwight collection of spines illustrating deformities, anomalies, diseases. Bone tumors, with X-rays, histories, and microscopic slides, with microscopes available for examination (some of these specimens were used in the illustrations in the monograph on "Bone Sarcoma" issued by the American College of Surgeons). Models showing various types of club feet and effects of operation. Pictures illustrating pathological conditions of bone in Dr. Nichols' collection. Fractures and dislocations of bones as they existed before industrial plants provided so many safeguards. Tuberculosis of bones and joints. Syphilis of bones. Dislocation of ends of bones. Collection of old surgical instruments, obstetrical forceps, turnkeys for extracting teeth, urological tools, cupping and leeching instruments.

NEWTON HOSPITAL

Tuesday

E. D. LEONARD—9. Breast amputation.

G. M. MORRISON—9. Reconstruction of elbow.

G. K. COONSE—9. Operation for fractured patellæ.

E. G. CRABTREE—9. Cystotomy.

F. W. MARVIN—9. Pantocain anæsthesia.

D. G. NUTTER—9:15. Desmoid cysts of the abdomen.

R. I. SMITH—9:30. Carcinoma of the duodenum.

G. C. PRATHER—9:30. Renal calculus.

N. P. BRACKETT—10. Strangulated hernia in the aged.

D. G. NUTTER—10. Hysterectomy for fibroids.

G. K. COONSE—10. Triceps repair of olecranon fracture.

G. M. MORRISON—10. Ankle fractures.

F. R. CLARK—10. Cæsarean section.

H. WATTERS—10:15. Intussusception in infancy.

D. G. WILCOX—10:30. Pyosalpinx.

E. D. LEONARD—10:45. Paralytic ileus.

R. I. SMITH—11. Complete thyroidectomy for angina pectoris.

N. P. BRACKETT—11. Cholecystectomy.

H. G. DUNPHY—11. Ligation of saphenous vein for varicose ulcer.

Fracture and orthopedic services—9. Dry clinic: Demonstration of application of plaster casts, Boehler technique; application of Anderson well leg traction apparatus; treatment of fractures of the spine, including hyperextension, frames, jackets, etc.; treatment of Colles' fracture by Cotton-Loder method; demonstration of new type humeral traction abduction splint.

Staff—2. Symposium on obstetrics. E. GRANVILLE CRABTREE: Discussion of urinary tract infection in pregnancy. GEORGE C. PRATHER: Discussion of lone kidneys in pregnancy. F. R. CLARK, M. F. EADES, and G. E. MAY: Pre- and postoperative care of patients.

ROBERT G. VANCE—2. X-rays of traumatic skulls.

CARNEY HOSPITAL

Daily

F. B. LUND and associates—9. General surgical operations.

L. E. PHANEUF and associates—9. Gynecological and obstetrical operations.

W. R. MACAUSLAND and associates—9. Orthopedic operations.

R. S. GRAVES and associates—9. Urological operations.

Staff—2:15. Dry clinics.

BETH ISRAEL HOSPITAL

Monday

Staff—2:30. Dry clinic. J. SEARS: Prophylactic vein ligation against embolism from phlebitis of the internal saphenous vein. M. BLOOMBERG: The prevention of scar tissue by use of baudruche, experimental and clinical experiences, demonstration of cases. W. LEVENSON: Intraperitoneal adhesions. L. HERMANSON: Transfusions during active bleeding from peptic ulcer. A. THURMAN: Surgical treatment of cholecystitis. J. MEZER: Subacute pancreatitis. J. FINE: Postoperative distension, an experimental study.

Tuesday

Staff—9. Symposium on total thyroidectomy for chronic heart diseases and angina pectoris. H. BLUMGART: Rationale of total thyroidectomy in chronic heart disease. J. RISEMAN: End-results of total thyroidectomy in angina pectoris. D. DAVID: End-results of total thyroidectomy in congestive heart failure. H. BLUMGART: Indications and contra-indications for surgery, selection of cases. C. G. MIXTER: General surgical considerations in total thyroidectomy. D. BERLIN: Technical considerations in total thyroidectomy. DOROTHY GILLIGAN: Postoperative parathyroid tetany. D. DAVIS: Treatment of postoperative complications. J. FINE: A technique for relief of temporary bilateral recurrent nerve injury. A. WEINSTEIN and M. ALTSCHULE: Total thyroidectomy, motion picture demonstration; demonstration of cases.

C. G. MIXTER and associates—2. Surgical operations including total thyroidectomy.

Wednesday

C. G. MIXTER and associates—9. Surgical operations.

Staff—10:30. Dry clinic. W. DAMESHEK: Blood changes in surgical conditions. DR. MORRISON: Medical conditions simulating surgical disease. DR. DEROW: Significance of postoperative rise in nonprotein nitrogen. ARNOLD STARR and DR. MUELLNER: Postoperative renal suppression. C. G. MIXTER: Surgery of the large intestine. S. CARGILL and DR. FALCON-LESSES: Thyroid clinic experiences, demonstration of cases.

E. G. CRABTREE and associates—9. Dry clinic, genito-urinary surgery. Symposium on the female bladder: Demonstration of various factors related to function in health, pregnancy, and disease; use of urethrogram and cystogram in diagnosis of bladder displacements and deformities in the multiparous woman, results of routine surgery; treatment of infections in the abnormal bladder.

Staff—2. Dry clinic. C. BEARSE: Acute appendicitis beyond age of fifty. W. J. MIXTER: Subject to be announced. B. RAPAPORT: Comparison on postoperative complications following spinal and general anæsthesia. J. FINE: Relation of diaphragm to the efficiency of cough. L. NASON: Gas bacillus infection complicating laparotomy. B. BANKS: Differential diagnosis of jaundice. DR. JANKELSON: Indications for ileostomy in ulcerative colitis. C. G. MIXTER: Regional ileitis. M. BARRON: Is radical resection for carcinoma of rectum the best procedure?

Thursday

Staff—9. Symposium on total thyroidectomy for chronic heart disease and angina pectoris. H. BLUMGART: Rationale of total thyroidectomy in chronic heart disease. J. RISEMAN: End-results of total thyroidectomy in angina pectoris. D. DAVIS: End-results of total thyroidectomy in congestive heart failure. H. BLUMGART: Indications and contra-indications for surgery, selection of cases. C. G. MIXTER: General surgical considerations in total thyroidectomy. D. BERLIN: Technical considerations in total thyroidectomy. DOROTHY GILLIGAN: Postoperative parathyroid tetany. D. DAVIS: Treatment of postoperative complications. J. FINE: Technique for relief of temporary bilateral recurrent nerve injury. A. WEINSTEIN and M. ALTSCHULE: Total thyroidectomy, motion pictures, demonstration of cases.

C. G. MIXTER and associates—2. Surgical operations including total thyroidectomy.

E. G. CRABTREE and associates—2. Bladder surgery, operative and dry clinic.

Friday

C. G. MIXTER and associates—9. General surgical operations.

W. J. MIXTER—9. Craniotomy.

MARK H. ROGERS and associates—9. Orthopedic dry clinic: Manipulation of subdeltoid bursitis, methods and results; slipping epiphysis, femoral neck; club foot, demonstration of application of plaster cast; method of drainage of septic knees, posterior incision; stenosing tenovaginitis, operative results; Nicola operation, end-results in cases of recurrent dislocation of shoulder; marble bones, repeated fractures of femur; fractures of long bones in Paget's disease; compression fractures of spine in diabetes and old age; correction of hallux valgus, temporary paralysis of sensory nerve affecting the joint.

E. G. CRABTREE and associates—2. Renal surgery.

Staff—2. Symposium on tumors. WILLIAM DAMESHEK: Malignancy of blood forming organs. L. M. FREEDMAN and H. F. FREIDMAN: Laryngeal carcinoma, diagnosis and treatment; presentation of cases. R. DAVIDOFF, C. G. MIXTER, and H. F. FREIDMAN: Breast tumors, differential diagnosis, surgical and radiation treatment. DR. SCHLESINGER: Diagnosis of malignancy from ascitic and pleural fluids. H. F. FREIDMAN and R. DAVIDOFF: Policy toward married women in regard to carcinoma of the uterine cervix. S. A. ROBBINS, E. G. CRABTREE, and G. E. PRATHER: Renal tumors, roentgen diagnosis, surgical treatment, results. G. E. PRATHER: Testicular tumors. J. H. SCHWARTZ and H. F. FREIDMAN: Carcinoma of the skin, diagnosis, motion picture demonstration of radium treatment.

Daily Exhibit in Medical Research Laboratories

Blood changes in surgical conditions; total thyroidectomy for chronic heart disease; renal function tests in surgery; demonstration of interesting and unusual X-ray films; surgical pathological specimens with case histories, photographs, etc.

LONG ISLAND HOSPITAL

Wednesday

R. H. MORRIS and T. H. PETERSON—9. Fracture clinic: Fracture of the neck of the femur in elderly people· demonstration of Soutter traction apparatus.

H. R. VIETS—9. Neurosurgical diagnosis.

J. H. CUNNINGHAM and C. S. SWAN—9. Urological operations.

A. S. MACMILLAN—2. X-ray demonstration.

I. B. AKERSON—2. Pathological demonstration.

C. L. SWAN, R. I. SMITH, and T. C. PRATT—2. General surgical operations.

ST. ELIZABETH'S HOSPITAL

Tuesday

JOSEPH STANTON—9. Subtotal thyroidectomy.
GEORGE KEENAN—9. Hysterectomy.
CHARLES KICKHAM—9. Supravaginal hysterectomy.
E. J. O'BRIEN—9. Transurethral resection of prostate gland.
E. M. HODGKINS—10. Repair of postincisional hernia with peritoneal fascial strips, by utilizing sac.
JOHN SPELLMAN—10. Radical operation for cancer of tongue.
THOMAS BRODERICK—10. Spine fusion.
BENEDICT BOLAND—11. Low transverse cervical section.
LAURENCE LOUIS—11. Total thyroidectomy.
Staff—2. Dry clinic. CHARLES KICKHAM: Series of spontaneous rupture of the uterus. RUSSELL SULLIVAN: End-results of bone and joint problems. LAURENCE LOUIS: Postoperative total thyroidectomy for (a) angina pectoris, (b) congestive heart disease. FRANCIS P. MCCARTHY: Frozen sections; demonstration and discussion of pathological specimens.

Wednesday

JOSEPH STANTON—9. Hysterectomy.
GEORGE KEENAN—9. Cholecystectomy.
RUSSELL SULLIVAN—9. Nicola operation for recurrence of dislocation of shoulder.
LAURENCE LOUIS—9. Radical operation, cancer of breast.
E. J. O'BRIEN—10. Nephrectomy for tuberculous kidney.
WILLIAM MCDONALD—10. Operation for correction of childbirth injury.
THOMAS BRODERICK—10. Reconstruction of hip joint.
M. MCGARTY—10. Removal of cartilage from knee joint.
EDWARD HODGKINS—11. Repair of recurrent inguinal hernia with fascial strips.
MARTIN SPELLMAN—11. Sacro-iliac arthrodesis.
Staff—2. Dry clinic. WILLIAM DOLAN: Industrial surgery. JOHN WHORISKEY: Diseases of the gall bladder, medical cases either refusing operation or being surgically unfit, demonstration of cases. FRANK JANTZEN: Cholecystitis and liver dysfunction (a) with hypopituitary syndrome, (b) with hypothyroid syndrome. MICHAEL MCGARTY: Flap graft in reconstruction of foot. JOHN CASEY: Disease of spleen from a surgical standpoint. THOMAS BRODERICK: Demonstration of spinal cases with operative technique, lantern slides.

Thursday

JOSEPH STANTON—9. Gastro-enterostomy.
BRYANT WETHERELL—9. Nephrectomy.
FRANK JANTZEN—9. Inguinal herniotomy under local anæsthesia.
EDWARD HODGKINS—9. Gastro-enterostomy.
THOMAS BRODERICK—10. Reconstruction of hip joint.
CHARLES KICKHAM—10. Prolapsed uterus with perineal repair and suspension.
WILLIAM DONOVAN—10. Suprapubic prostatectomy.
EDWARD O'BRIEN—10. Suprapubic cystostomy.
MICHAEL MCGARTY—11. Fascial repair of double recurrent inguinal hernia.
BENEDICT BOLAND—11. Tubal plastic for sterility.
Staff—2. Dry clinic. WILLIAM O'HALLORAN: Medicine from a pre-operative and postoperative standpoint. BRYANT WETHERELL: Discussion of diagnosis of carcinoma of bladder. WILLIAM MCDONALD: Polyneuritis in pregnancy. JAMES LYNCH: Vulval phlebitis complicating pregnancy, antenatal. JOSEPH STANTON: Hypocalcemia of unusual origin, gastric ulcer; demonstration of interesting clinical cases.

NEW ENGLAND HOSPITAL FOR WOMEN AND CHILDREN

Tuesday

Staff—9. Surgical operations.
Staff—2. Dry clinic: Carcinoma of fundus in young woman treated for amenorrhœa with antuitrin-S; fibrosarcoma of liver in six year old child; carcinoma of kidney with metastasis in three year old child; unusual pathological specimens with case histories.

Wednesday

Staff—9. Surgical operations.
Staff—9. Obstetrical analgesia demonstration of cases; ward rounds; prenatal clinic; parent-teaching clinic.

Thursday

Staff—9. Surgical operations.
Staff—9. Orthopedic operations; demonstration of unusual case of fractured pelvis.
MIRIAM KATZEFF—9. Familial muscular dystrophy.

Friday

Staff—9. Surgical operations.

ROBERT B. BRIGHAM HOSPITAL

Monday

L. M. SPEAR—2. Classification of types of arthritis.
L. T. SWAIM and J. KUHNS—3. Treatment and orthopedic principles involved in arthritis.

Tuesday

H. K. THOMPSON—2. Clinical analysis of arthritis with reference to classification and treatment.
P. D. WILSON and S. ROBERTS—3. Discussion of operative procedures, demonstration of end-results.

Wednesday

L. M. SPEAR—2. Classification of types of arthritis.
L. T. SWAIM and J. KUHNS—3. Treatment and orthopedic principles involved in arthritis.

Thursday

H. K. THOMPSON—2. Clinical analysis of arthritis with reference to classification and treatment.
P. D. WILSON and S. ROBERTS—3. Discussion of operative procedures, demonstration of end-results.

CHELSEA MEMORIAL HOSPITAL

Thursday

Staff—9. Dry clinic. CHARLES P. SHELDON: Septic abortions. LLEWELLYN H. ROCKWELL: Perforated duodenal ulcer. GEORGE A. MARKS: Acute appendicitis with peritonitis. SYLVESTER B. KELLEY: Causes of death in prostatitis.
Staff—2. General surgical operations.
Staff—2. Dry clinic. GORDON MORRISON: Abdominal trauma. STEPHEN G. JONES: Volkmann's contracture. ALEXANDER P. AITKEN: Epiphyseal separation of the radius. JOHN S. HODGSON: Fractures of the skull. Discussion by FREDERICK J. COTTON.

SYMMES ARLINGTON HOSPITAL

Tuesday

F. J. COTTON—9. Bone and joint surgery.
A. L. BRETT—9. Tumor of the spinal cord; shoulder arthrodesis.
G. P. TOWLE—9. General surgery.
S. G. JONES—9. Volkmann's paralysis.

BOSTON DISPENSARY

Tuesday

Tumor clinic staff—9. Dry clinic. FRANK W. MARVIN: Anæsthesia in operative cases. CHARLES M. PROCTOR: Precancerous and benign lesions of the oral cavity. CHARLES E. DUMAS: Radiation technique in malignancy of the throat. LEROY A. SCHALL: Treatment of cancer of tonsil. GEORGE S. SPEARE: Malignant degeneration of sebaceous cysts. LOUIS E. PHANEUF: Precancerous lesions and cancer of the cervix, lantern slide demonstration. ALICE ETTINGER: Early diagnosis of malignancy of gastro-intestinal tract by relief method. HAROLD A. CHAMBERLIN: Papillary tumors of the kidney pelvis. ROGER C. GRAVES: Management of cancer of penis with particular reference to a modified operation for advanced cases. MYRON J. HAHN: Cancer of the prostatic capsule. ISADORE OLEF: Management of malignancy of the lymphatic system. HILBERT F. DAY: Cancer of breast, end-results of dispensary and personal cases. JOEL ROSENBERG: Bleeding carcinoma of breast without tumor. WILLIAM M. SHEDDEN: Management of cancer of rectum with particular reference to irradiation. HAROLD MCMAHON: Relation of pathology department to tumor clinic.

Wednesday

Staff—10. Dry clinic. OLIVER G. TINKHAM: Clinical teaching of third year medical students. FRANCIS P. BARNUM: Use of adhesive plaster. P. A. CONSALES: Adenomatous changes in aberrant thyroid. HILBERT F. DAY: Management of a varicose vein clinic, where over 150 treatments a week are given. EDWARD T. WHITNEY: Varicose ulcers, demonstration of cases and treatment. WALTER S. LEVENSON: High ligation of varicose veins. WILLIAM M. SANTORO: Injection treatment of varicoceles. S. SEYMOUR HORLICK: Results of multiple injections of varicose veins at same visit. HILBERT F. DAY: Results of excision of sloughs following injection treatment.

Thursday

Staff—9. Dry clinic. JOHN D. ADAMS: Shueller-Christian disease (xanthomatosis); bone tumors. ROY E. MABREY: Chordoma and chondrosarcoma. WILLIAM A. HINTON: Detection of syphilis as an aid in practice of surgery. FRANCIS M. THURMON: Syphilis and the differential diagnosis of surgical conditions. JOSEPH SKIRBALL: Ophthalmic studies in syphilis. GRACE E. ROCHFORD: An unusual gynecological condition. LOUIS A. O. GODDU: Pain in the shoulder girdle. ROBERT W. BUCK: Kidney function; renal function tests. WILLIAM E. DAVIS: Some observations in treatment of peptic ulcer in out-patient clinic. ALICE ETTINGER: Diagnosis of activity of duodenal ulcer by X-ray. KATHERINE S. ANDREWS: Hiatus hernias. HILBERT F. DAY: Solitary gall-stone pain relieved by posture. Demonstration of interesting X-ray plates of peptic ulcer and gall-bladder disease.

HARVARD UNIVERSITY

(Dillon Field House, Soldier's Field)
Opposite Harvard Stadium, Allston, Mass.

Wednesday

AUGUSTUS THORNDIKE, JR.—2. Care and prevention of traumatic injuries in athletics; demonstration of protective strapping, padding, and apparatus used in modern athletics.

CAMBRIDGE CITY HOSPITAL

Tuesday

H. H. GERMAIN, D. F. MAHONEY, E. J. O'BRIEN, E. D'ERRICO, and E. DOWNEY—9. Dry clinic. H. H. GERMAIN: Results in surgery of the shoulder, nerve suture; partial rupture of posterior cord of brachial plexus; fascial graft for recurrent dislocation of shoulder; arthroplasty of shoulder; arthroplasty for ankylosis of temporomaxillary articulation; skin graft for extensive burns. D. F. MAHONEY: End-results in fracture of pelvis and humerus. E. J. O'BRIEN: End-results in transurethral resection of the prostate; massive diverticulum of the bladder in a child 2½ years old. E. J. O'BRIEN: X-ray films of injuries to the head and spine. B. A. GODVIN and WALDO ROBBINS: Orthopedic clinic; end-results in fracture of hip. E. D'ERRICO: Results in injection treatment of varicose veins, moving picture demonstration. E. DOWNEY: Injection treatment of hæmorrhoids, methods used and demonstration of cases.

Wednesday

H. H. GERMAIN—9. Surgical operations. Demonstration: Nussbaum operation for leg ulcer (2 cases); tumor of the parotid (2 cases).

Staff—9. Dry clinic. MAXWELL MACDONALD: Encephalography as an aid to diagnosis in cerebral lesions. F. G. MINITER and T. E. DINAN: Results of accessory sinus operations, demonstration of cases. R. D. YOUNG: Cæsarean section. F. J. LYNCH: To be announced. J. J. MURPHY: Treatment problems of burns in general hospital. J. W. ROCKETT: Oral surgery operations. ARTHUR SARGENT and WILLIAM LANNIGAN: Orthopedic and fracture clinic. F. O. O'BRIEN: Traumatic spine and head injuries, demonstration of X-ray films. J. W. ROCKETT and F. MCLEAN: Fractures of lower and upper jaw. M. SHEA: Arthroplasty of lower jaw.

E. J. O'BRIEN and L. ROCKWELL—10:30. General surgical operations.

E. D'ERRICO—2. Acute torsion of great omentum; appendicitis complicating pregnancy.

Thursday

D. F. MAHONEY—9. General surgical operations.

J. J. MURPHY—10:30. General surgical operations; problem of rupture of urethra, fracture of pelvis and fracture of femur.

F. O. O'BRIEN—11. Traumatic spine and head injuries, demonstration of X-ray films.

MASSACHUSETTS WOMEN'S HOSPITAL

Thursday

HENRY T. HUTCHINS—9. Panhysterectomy.

STEPHEN RUSHMORE—9. Plastic laparotomy.

WILLIAM A. WHITE, JR.—9. Laparotomy.

REGINALD MARGESON—9. Transverse cervical cæsarean section.

ROBERT L. MASON—9. Thyroidectomy.

Staff—2. Dry clinic. CHARLES H. LAWRENCE: Endocrine sterility, end-results. DONALD MACOMBER: Problems of sterility. CHARLES F. PAINTER: Congenital obturator dislocation of right hip; causes of eburnation of bone. J. STEWART ROONEY: Pathological specimens.

BEVERLY HOSPITAL

Thursday

PEER JOHNSON and JOHN ADAMS—10. Fracture clinic.

FAULKNER HOSPITAL

Wednesday

F. J. COTTON, E. G. BRACKETT, and associates—9. Bone and joint clinic, operative and dry.

Staff—2. Dry clinic. E. G. BRACKETT: Hip fracture. F. J. COTTON: Bone tumors; fractures of pelvis. H. C. MARBLE: Hand surgery; fractures of the forearm. J. D. ADAMS: Industrial lesions of the knee. WILLIAM A. ROGERS: Compression fracture of spine. E. A. CODMAN: Shoulder lesions. B. GODVIN: Os calcis fractures. W. F. COTTING: Ankle fractures. H. K. SOWLES: Elbow fractures. Demonstration of X-ray plates and pathological specimens.

Thursday

E. L. YOUNG, JR., R. C. COCHRANE, A. R. KIMPTON, and associates—9. Operative clinic.

J. R. TORBERT and R. S. TITUS—11. Obstetrical clinic.

S. W. WIGGIN—11. Postoperative pulmonary complications.

Staff—2. Symposium on pre-operative immunization of the peritoneal cavity: H. L. JOHNSON: Theoretical and experimental evidence of the benefit of amfetin. E. L. YOUNG, JR. and EVERETT O'NEIL: Clinical evidence of immunity from amfetin injection. R. C. COCHRANE and BURTON HAMILTON: Total thyroidectomy for heart disease. F. G. BALCH, JR.: Injection treatment of hæmorrhoids.

EVANGELINE BOOTH MATERNITY HOSPITAL

Wednesday

A. K. PAINE, H. S. FINKEL, W. J. MCDONALD, M. G. BERLIN, J. HOPKINS, D. GOLDFARB, A. A. LEVI, J. J. CONWAY, H. BAKER, S. OSGOOD, and R. T. PHILLIPS—9. Gynecological operations and obstetrical procedures.

Staff—2. A review by demonstration, charts, pictures, and exhibits, of the obstetrical experience of the Booth Hospital: Maternal mortality, factors responsible for the declining rate at the Booth Hospital; the bleeding cases, statistics, management, and results; obstetrical sepsis; amnesia, analgesia, and anæsthesia in labor, results from the standpoint of safety, efficiency, effects on operative incidence; cæsarean section, incidence, indications, and mortality; toxæmia of pregnancy, treatment methods and results over a fourteen year period; "debunking" pelvimetry; heart disease complicated by pregnancy; fetal mortality, analysis of four hundred cases, pathology.

INDUSTRIAL SURGERY

Tuesday

H. C. MARBLE and H. P. TOWLE (142 Berkeley Street)—9.

D. LYNCH and B. GODVIN (245 State Street)—9.

Wednesday

G. W. MORSE (31 St. James Avenue)—9.

Thursday

WILLIAM DOLAN (110 Milk Street)—9.

Friday

J. H. SHORTELL (260 Tremont Street)—9.

D. LYNCH and B. GODVIN (245 State Street)—9.

MASSACHUSETTS MEMORIAL HOSPITAL

Daily

Staff—9. Operative clinics.

Staff—2. Dry clinics.

NEW ENGLAND BAPTIST HOSPITAL

Tuesday

HALSEY B. LODER—9. Operative clinic.

Staff—9. Dry clinics. HALSEY B. LODER: Portal thrombosis; ulcerative colitis; gall stones, pancreatitis; uterine fibroids. A. A. HORNOR: Ulcerative colitis. ROBERT L. DENORMANDIE and DELOS J. BRISTOL: Blood transfusion in obstetrics; management of borderline obstetrical cases; anæsthesia and analgesia in obstetrics; prevention of eclampsia.

Thursday

F. H. LAHEY, H. M. CLUTE, R. B. CATTELL, and R. H. OVERHOLT—9. General surgery, operative clinic.

GILBERT HORRAX and JAMES POPPEN—9. Neurosurgical operations.

G. E. HAGGART—9. Orthopedic surgery.

JAMES B. HICKS—9. Urological surgery.

LINCOLN F. SISE, PHILIP D. WOODBRIDGE, and URBAN EVERSOLE—9. Anæsthesia.

BOSTON LYING-IN HOSPITAL

Tuesday and Thursday

FREDERICK C. IRVING and associates—9. Obstetrical operations; demonstrations of premature nursery, X-ray department, research laboratories, and hospital wards.

FREDERICK C. IRVING and associates—2. Dry clinic: Fetal roentgenometry; anæmia in pregnancy; treatment of heart disease in pregnancy; treatment of diabetes in pregnancy; management of neglected cases of cephalopelvic disproportion; treatment of placenta prævia; separation of the symphysis pubis; kidney function tests in pregnancy; classification of the albuminuric and hypertensive conditions in pregnancy; factors which make for viability in premature infants; erythroblastosis fetalis; barbiturates and other analgesic drugs in labor.

MALDEN HOSPITAL

Wednesday

L. E. PHANEUF and N. A. GALLAGHER—9. Gynecological operations.

R. SULLIVAN—9. Orthopedic clinic.

L. W. MCQUIRE—9. Amœbic dysentery and its complications.

C. F. LYNCH, D. J. DUGGAN, I. J. WALKER, and F. W. GAY—2. Surgical operations.

Staff—2. Dry clinic. J. S. ROONEY: Pathological demonstration. I. J. WALKER: Discussion of jaundice with demonstration of liver specimens. L. SILVA: Discussion of coronary and gall-bladder disease in middle-aged people with electrocardiographic tracings. C. H. STAPLES: Hyperpituitarism, demonstration of cases.

STATE PRISON COLONY

Day to be announced

HILBERT DAY. Practice of medicine in a modern correctional institution.

WILFRED BLOOMBERG. Psychiatric approach to prison medicine.

HENRY R. CRAIG. Unusual incidence of peptic ulcer in a prison population.

GEORGE H. LYONS. Minor surgical injuries in a protected population.

GEORGE ROTHBLATT. Dental conditions causing personality changes.

WALTHAM HOSPITAL

Friday

R. L. DeNormandie, T. W. Harmer, D. Munro, J. D. Barney, J. W. Sever, H. Q. Gallupe, R. Collins, and H. A. Wood—9. Surgical operations.

R. L. DeNormandie, T. W. Harmer, D. Munro, J. D. Barney, J. W. Sever, H. Q. Gallupe, R. Collins, and H. A. Wood—2. Dry clinics: General surgery, orthopedics, obstetrics, pathology, etc.

LAKEVILLE SANATORIUM

Wednesday

Z. B. Adams—9:30. Ankylosis of hip, operative. Ward rounds.

Staff—2. Dry clinic: Tuberculosis of lymph nodes, genito-urinary tract, eye, gastro-intestinal tract, peritoneum, and skin.

Z. B. Adams—2. Orthopedic dry clinic.

SURGERY OF THE EAR, NOSE AND THROAT

MONDAY

H. Davis, H. A. Derbyshire, and M. H. Lurie—Harvard Medical School, Bldg. C—3. Physiological experiments on the hearing of animals with the technique first reported by Wever and Bray; report of the pathological conditions found in animals with abnormal hearing, demonstrating technique and apparatus used; physiological experiment conducted on animal with the apparatus used, demonstrating (1) auditory response obtained from the cochlea itself; (2) auditory response from the cochlear nerve and its various ganglion centers in the midbrain; (3) auditory response as obtained from the cortex of the animal in the temporal lobe; (4) the effect of anæsthetics on these electrical responses; (5) demonstration of masking of tones in the cochlea.

F. E. Garland—Harvard Medical School, Bldg. B. Demonstration of historical instruments.

TUESDAY

Staff—Massachusetts Eye and Ear Infirmary—9. Operations and demonstration of cases.

Walter B. Hoover—New England Deaconess Hospital—9. Osteoma of sinuses; laryngeal and tracheal complications of thyroid surgery; lingual tonsils and lateral bands of pharyngeal lymphoid tissue; syndrome of anæmia, glossitis, and dysphasia.

Joseph W. Rockett and Thomas E. Dinan—Cambridge City Hospital—9. Tonsillectomies with gas-oxygen anæsthesia; presentation of cases of lateral sinus thrombosis.

F. G. Miniter and associates—Carney Hospital—9. Operation and demonstration of cases.

William T. Haley—St. Elizabeth's Hospital—11. Operation for correction of dislocation of nasal septum.

H. P. Mosher—Harvard Medical School, Bldg. B—2. Exhibition of anatomical cases demonstrating the anatomy of the nose and throat; discussion of teaching methods; demonstration on the cadaver of the submaxillary approach for deep pus in the neck. P. E. Meltzer and M. H. Lurie: Exhibition of specimens illustrating the anatomy of the ear.

Staff—Beth Israel Hospital—2. L. M. Freedman: Experiences with vocal cord paralysis in thyroidectomy. D. J. Fine: Technique for relief of bilateral recurrent nerve injury. Charles Gettes: Studies on galvanism in vestibular tests. L. M. Freedman: Jugular puncture in mastoiditis. S. Cline: Tuberculous laryngitis and its treatment. S. Garfin: Treatment of malignant tumors of the upper respiratory tract. L. M. Freedman: Bronchoscopic studies.

F. E. Garland—Massachusetts Eye and Ear Infirmary, Hooper room. Demonstration of historical instruments.

WEDNESDAY

Staff—Massachusetts Eye and Ear Infirmary—9. Operations and demonstration of cases.

Walter B. Hoover—New England Deaconess Hospital—9. Operations.

Harry J. Inglis and associates—Boston Dispensary—9. Dry clinic. Louis Wolfson: Bronchoscopy in the upright position as an out-patient procedure. A. I. Cohen, F. S. Dushan, and Francis Stern: An improved method of skin testing in allergic disturbances of nose and throat.

Staff—Children's Hospital—9. Lyman Richards: Acute laryngotracheobronchitis. Maurice Evans: Bilateral jugular ligation and its neurological complications. Philip Mysel: Cerebral abscess. Chester Mills: Sinusitis. Josiah E. Quincy: Radical mastoid operation. Charles Allman: Unusual foreign bodies. Elmer Gillespie: Complications in simple mastoidectomy. Samuel Cline: Cases of sinus thrombosis.

F. G. Miniter and associates—Carney Hospital—9. Operations and demonstration of cases.

John Burns—St. Elizabeth's Hospital—11. Radical sinus operation under nerve block.

F. E. Garland—Harvard Medical School, Bldg. B. Demonstration of historical instruments.

THURSDAY

Staff—Massachusetts Eye and Ear Infirmary—9. Operations and demonstration of cases.

Walter B. Hoover—New England Baptist Hospital—9. Operations.

E. J. Butler and C. H. Allman—Cambridge Hospital—9. Operative and dry clinic. Hæmatogenous infection of left mastoid with extradural abscess in a nine months old child; pneumococcus type III meningitis with labyrinthitis, demonstration of case.

F. G. Miniter and associates—Carney Hospital—9. Operations and demonstration of cases.

C. Faunce—Faulkner Hospital—11. Operations and demonstration of cases.

William T. Haley—St. Elizabeth's Hospital—11. Radical operation for maxillary antrum.

John Burns—St. Elizabeth's Hospital—11. Radical mastoid operation.

F. E. Garland—Harvard Medical School, Bldg. B. Demonstration of historical instruments.

FRIDAY

Staff—Massachusetts Eye and Ear Infirmary—9. Operations and demonstration of cases.

Walter B. Hoover—New England Deaconess Hospital—9. Operations.

F. G. Miniter and associates—Carney Hospital—9. Operations and demonstration of cases.

Staff—Massachusetts Eye and Ear Infirmary—2. Dry clinic. H. P. CAHILL: The present status of brain abscess from the standpoint of the otologist. P. E. MELTZER: A twelve year summary of cases of lateral sinus thrombosis at the Infirmary. P. MYSEL: A ten year review of cases of labyrinthitis at the Infirmary. D. C. SMYTH: Chest cases requiring bronchoscopy, lantern slide demonstration. A. S. MACMILLAN and D. C. SMYTH: The accessory sinuses from the standpoint of the roentgenologist and the clinician. A. S. MACMILLAN: Petrositis from the X-ray standpoint. G. H. POIRIER: Result of the Mosher-Toti tear sac operation. M. H. LURIE: Histological slides showing the pathological condition of the internal ear. E. W. HERMAN: Radium and X-ray treatment of cancer of the larynx. H. P. MOSHER: Notes on œsophageal cases. F. E. GARLAND: Surgery of the submaxillary gland. C. G. PAGE: Fungi in tracheal and bronchial mucous. G. L. TOBEY, JR.: The Tobey-Ayer test.

F. E. GARLAND—Harvard Medical School, Bldg. B. Demonstration of historical instruments.

Days to be announced

ISABELLA D. KERR—New England Hospital for Women and Children. The use of avertin anæsthesia in tonsillectomies.

MARGARET NOYES KLEINERT—New England Hospital for Women and Children. Mastoidectomies in infants.

L. F. JOHNSON—Massachusetts Memorial Hospital. Bronchoscopic operative clinic.

C. W. BUSH, R. O. PARRIS, and B. N. WEIN—Massachusetts Memorial Hospital. Operations.

H. L. BABCOCK—Massachusetts Memorial Hospital. Otological problems in contagious diseases.

A. W. ROWE and D. W. DRURY—Massachusetts Memorial Hospital. Endocrine factors in deafness.

OLIVER A. LOTHROP—Newton Hospital. Tonsil, sinus and septum operations; reduction of recent fractures of the malar and nasal bones; discussion of the indications for mastoid and sinus surgery.

CHARLES I. JOHNSON, DONALD H. MACDONALD, and EDGAR M. HOLMES—Newton Hospital. Operations and demonstration of cases.

SURGERY OF THE EYE

MONDAY

Staff—Massachusetts Eye and Ear Infirmary—2. Operations.

V. G. CASTEN—Massachusetts Eye and Ear Infirmary—2. Visual fields in neurological cases.

T. L. TERRY—Massachusetts Eye and Ear Infirmary—2. Pathological demonstration.

J. H. WAITE and associate—New England Deaconess Hospital—2. The eye in diabetes.

W. B. LANCASTER—520 Commonwealth Ave.—2. The Eikonometer.

TUESDAY

H. B. C. RIEMER and assistant—Massachusetts Eye and Ear Infirmary—9. Operations.

A. J. BEDELL—Massachusetts Eye and Ear Infirmary—9. Technique in photographing the fundus.

J. W. WHEELER—Massachusetts Eye and Ear Infirmary—9. Plastic operations.

W. D. ROWLAND—Massachusetts Memorial Hospital—9. Operations.

J. S. FRIEDENWALD—Massachusetts Eye and Ear Infirmary—9. Slit-lamp ophthalmoscopy.

PETER MCADAMS—St. Elizabeth's Hospital—11. Operations.

WEDNESDAY

J. H. WAITE and assistant—Massachusetts Eye and Ear Infirmary—9. Operations.

A. J. BEDELL—Massachusetts Eye and Ear Infirmary—9. Technique of photographing the fundus.

F. H. VERHOEFF and assistant—Massachusetts Eye and Ear Infirmary, Howe Laboratory—9. Operations and demonstration of cases.

Staff—Carney Hospital—9. Operations.

Staff—Boston Dispensary—9. The eye and syphilis.

HUGH DONAHUE—St. Elizabeth's Hospital—11. Operation for cataract.

ALLEN GREENWOOD—Massachusetts Eye and Ear Infirmary—2. Fundus cases.

T. L. TERRY—Massachusetts Eye and Ear Infirmary—2. Contact glasses.

Staff—Massachusetts Eye and Ear Infirmary—2. Motion picture demonstration of operations.

J. J. REGAN, SOMA WEISS, and DONALD MUNRO—Boston City Hospital—2. The eye in arteriosclerosis.

V. G. CASTEN—Long Island Hospital—2. Operative and dry clinic.

THURSDAY

E. K. ELLIS and assistant—Massachusetts Eye and Ear Infirmary—9. Operations.

H. B. C. RIEMER—Massachusetts Eye and Ear Infirmary—9. External diseases of the eye.

B. SACHS—Beth Israel Hospital—9. Operative and dry clinic.

C. N. SPRATT and others—Massachusetts Eye and Ear Infirmary—9. Motion pictures of operations.

FRIDAY

W. H. LOWELL and assistant—Massachusetts Eye and Ear Infirmary—9. Operations.

DR. MCCARTHY—Massachusetts Eye and Ear Infirmary, Howe Laboratory—9. Color vision testing.

J. J. REGAN—Boston City Hospital—9. Operations.

V. G. CASTEN—Massachusetts Eye and Ear Infirmary—2. Neurological cases; ocular paralysis.

T. L. TERRY—Massachusetts Eye and Ear Infirmary—2. Pathological demonstration.

E. B. DUNPHY—Massachusetts Eye and Ear Infirmary—2. Traumatic cases, operations and results.

J. J. REGAN and W. B. CASTLE—Boston City Hospital—2. The eye in anæmic patients.

SCIENTIFIC EXHIBITS

AT HEADQUARTERS, STATLER HOTEL

FRACTURES. Demonstrating methods of treating fractures, under the auspices of the New England Fracture Committee of the American College of Surgeons.

PLASTIC SURGERY. An exhibit of models, photographs, and diagrams, illustrating the different methods employed in plastic surgery and the results.

TRAUMATIC SURGERY. Diagrams, photographs, and charts.

ORTHOPEDIC SURGERY. An exhibit of splints and other forms of orthopedic apparatus, together with charts and photographs.

MASSACHUSETTS DEPARTMENT OF PUBLIC HEALTH. An exhibit illustrating the activities of this department.

CANCER. An exhibit from the Palmer Memorial Hospital, Collis P. Huntington Memorial Hospital, and the Pondville State Cancer Hospital. Lantern slides, charts, and photographs illustrating cancer of the various organs of the body; the diagnosis and the results obtained by different forms of treatment. Also, an exhibit of specimens of cancer from many parts of the body.

OPHTHALMOLOGY. Charts and photographs illustrating melanotic sarcoma and other conditions of the eye. Heredity of immune reactions; hereditary blindness; pedigree of blindness.

PATHOLOGY. The specimens removed at operations from the various hospitals in the morning will be collected and placed on exhibition in artificially cooled showcases in the afternoon, in a room adjoining the Georgian Room. At 5 p.m. these specimens will be demonstrated in the Georgian Room by a projectoscope, the microscopic sections shown, and the cases discussed.

AT HOSPITALS AND MEDICAL INSTITUTIONS

HARVARD DENTAL SCHOOL. An exhibit of models, photographs, and diagrams showing the restoration of extensive defects and deformities of the face and jaws by plastic surgery and dental prosthesis, including cases of soldiers wounded in the World War.

BOSTON MEDICAL LIBRARY. Exhibit of historical books on surgery and anatomy, and surgical medals. Historical pageant illustrating the development of surgery, Wednesday, October 17, John Ware Hall, 4 p.m.; presented by the students of Tufts College Medical School under the direction of Professor B. Spector. Exhibition of works of art by Massachusetts physicians under auspices of the Physicians Art Society.

MASSACHUSETTS GENERAL HOSPITAL. An exhibit in the Ether Dome relative to the first public demonstration of ether anæsthesia. Showing of moving picture "The First Public Demonstration of Ether Anæsthesia."

MASSACHUSETTS CHARITABLE EYE AND EAR INFIRMARY. Anatomical specimens and œsophageal instruments.

HARVARD MEDICAL SCHOOL, Warren Museum. Anatomy, anatomical specimens; pathology, pathological specimens.

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ALLEN B. KANAVEL, M.D.

TODAY we honor SURGERY, GYNECOLOGY AND OBSTETRICS by publishing in this number a group of papers by surgical colleagues, associates, and students of Allen B. Kanavel. Dr. Kanavel was one of five men who aided in establishing this journal. He has been our associate editor continuously for 29 years. Throughout the existence of the journal he has devoted to its guidance a generous portion of his time, and we are happy in the realization that he will continue to lend to it his support for many years to come.

It is not given to many men to combine so happily as has Dr. Kanavel the teaching of surgery, the practice of surgery, and the development of new and incompletely explored fields of surgery. As professor of surgery in Northwestern University Medical School he has taught theoretical and clinical surgery; at the Post Graduate Hospital, at Wesley Memorial Hospital, at the Cook County Hospital, and more recently at Passavant Memorial Hospital he has for many years carried the burden of a large and busy surgical service; and still he has found time to carry out investigative work in surgical fields and to undertake the literary work necessary to bring the results of his investigations before the surgical profession.

Notable among his literary productions in many and in varied fields of surgery is his textbook on *Infections of the Hand*, the result of painstaking, original clinical and experimental research. Allen Kanavel has always been an ardent believer in practical research. Years ago, confined to his bed with a serious infection of his hand, he watched and studied the course of the infection, and the unsatisfactory conventional treatment which was administered. The theories which he formulated at that time, and later demonstrated as correct by experimental and clinical work, resulted in his classic monograph and his many publications on infections of the hand.

His interest in infections of the hand logically led to a study of the repair of hands crippled by infection and injury, and to the many helpful contributions which he has published on the reconstructive surgery of the hand. In the same way his interest in reconstructive surgery of other parts of the body, in peripheral nerve surgery, in the surgery of the brain and spinal cord, and in the broad field

of thyroid and of abdominal surgery seemed to follow as a natural corollary to the studies on infection so auspiciously begun in the early years of his surgical work.

Throughout his professional career he has quietly insisted that medical and surgical teaching should stress clinical applications and that this practical view should be uppermost in the minds of instructors in medical schools. As one of the leading teachers in the surgical world he has imparted to his students not only academic knowledge, but has drilled them in surgical principles upon which they might base a sound conception of medicine and surgery.

He has believed that the editor of a surgical journal should be an active practitioner of clinical surgery. His practical mind can conceive of no other method as likely to succeed. As an editor of SURGERY, GYNECOLOGY AND OBSTETRICS he has appreciated the importance of a broad knowledge of medical progress all over the world; and so has persistently interested himself in the INTERNATIONAL ABSTRACT OF SURGERY as an increasingly helpful agency in keeping the surgical profession of America in touch with the work of their colleagues in their own and other lands. He urged the creation of the department of clinical surgery, through which the readers of the journal are permitted intimate glimpses into the methods of leading clinicians of the world.

He was a member of the committee on organization of the Clinical Congress. He has been a member of the board of regents and executive committee of the American College of Surgeons for many years, and served as its president in 1931–1932. He has supported the plan of the journal to award an annual prize for the most acceptable set of case records presented by candidates for Fellowship in the American College of Surgeons during the preceding year. He aided in the establishment of the department of literary research of the College of Surgeons, for he realized that through such a department authoritative aid could be furnished to men who do not have endowed or university libraries at their disposal.

It is a matter of great pride to welcome this unusual opportunity to pay tribute to the fine judgment, the devotion, and the loyalty of Allen Kanavel. I knew him first as my assistant; then as my associate; and as a personal friend throughout an almost daily contact over a period of thirty-four years. I honor him as student, scholar, teacher, orator, and citizen—an outstanding statesman in the profession of scientific medicine.

Franklin H. Martin

September 2, 1934.

Fig. 18. Case 20. Acute spreading infection of the left upper extremity following nail puncture wound just distal to the metacarpophalangeal joint of the middle finger. (See also Fig. 19.)